THE Chemical Age

VOL. LXXIV | 28 JANUARY 1956 | No. 1907

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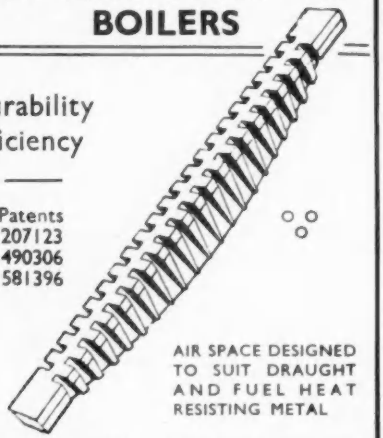

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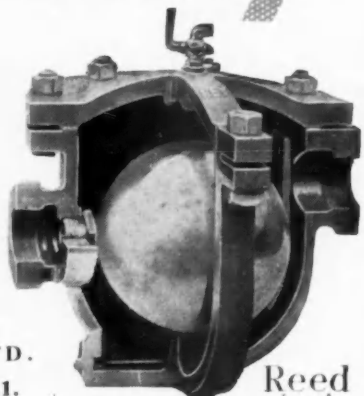

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Making Chemists

FOR once in a way we can discuss the vital subject of chemical education with only passing reference to the current problem of science teaching man-power. For that is not the only modern problem and in any case we have commented on it often enough. We will even make the comfortable assumption that a well-equipped school has an adequate number of first-class men to teach chemistry to an equally adequate number of potential chemists. In 1956 a situation of such rarity would still have its serious problems—what to teach and how to teach are matters of selection and opinion far more formidable than 20 or 30 years ago. Chemistry as a subject has grown and ramified to such an extent that it now defies reasonable definition, but the years of youth have not been extended; in the same passage of time between third-form ventures into the laboratory and final university graduation, so much more must be taught if the eventual product is to possess a reasonable general understanding of contemporary chemistry. Recently we mentioned reports (see THE CHEMICAL AGE, 1955, **73,** 1401) which suggested that this huge modern load was making chemistry less popular as a subject of pupil and student choice. The path of higher education in several other subjects is now much easier, and a great deal of the 'attractiveness' of chemistry has vanished.

The basic principles of chemistry have become both abstract and complex. For many years they have been abstract, but even the tougher concepts of physical chemistry were simple compared with quantum and wave mechanics. This has no obvious connection with teaching chemistry in schools. At the 1955 British Association meeting, Professor Coulson went as far as to say that quantum theory was too wide and complicated to present to university students, yet at the same time he stated that no chemical education failing to take this development into account was worth considering. At some point in the long-term process of making a chemist the ability to absorb these new approaches to chemical understanding must be prepared. Without this preparation many students find themselves unable to make the sudden jump from chemistry in its older garb of infinitely minute atoms and molecules to chemistry in its mid-20th century dress of electronic energy-levels and orbitals. Yet excessive preoccupation with modern theory may well destroy many a natural capacity for practical chemistry, the flair for experimentation that has made so many great chemists and can perhaps be compared only to the 'green-fingers' of good gardeners. The dilemma is not small and it has no ready solution. But for the man-power difficulty that is bedevilling science teaching in so many schools, we should hear much more of this other problem.

Three science masters, each from public schools, took part in the papers and discussion of this subject at the British Association meeting. One view was that new advances in chemical theory should

be introduced into school teaching without undue delay, but in simplified forms; by a somewhat strange argument, this policy was advocated as one means by which a science teaching career could be made more attractive. It is hard to tell from a belated report in print how seriously this argument was pressed, but it surely confuses two totally different problems; here the problem is with the pupil's attraction and development, not the teacher's. Another contribution from the schoolroom expressed fears that the evidence upon which modern theories are based would not be understood, that the pupil's critical sense would be dulled by having to accept these advanced pictures of the atomic and molecular states in 'parrot-fashion'. Many must sympathize with this view. Can even the best of schools teach enough physics and mathematics for these modern chemical theories to be grasped with any reality? Even if this is possible, will the efforts made by the learner have left much time and capacity to acquire a reasonable knowledge of basic chemistry as well? The third contribution doubted whether modern concepts of valency could be usefully introduced into the school syllabus.

Although these views varied in degree, all of them insisted that specialization should be avoided. But can chemistry be taught in the time without specialization? If more new ideas must be taught, less time must be given to older ones; every decision that is selective is a sort of specialization. If, as one teacher suggested, a sixth-form course is basically theoretical, this is specialization.

The idea of the historical approach in teaching chemical theory was given little support. Presumably it must be discarded or partly discarded because it is lengthier. Yet it is the stage-by-stage process through which our mid-20th century concepts have all evolved. From the very start one idea has led to the next. A powerful defence of the historical approach was made in the unique ACS *Journal of Chemical Education*, by Samuel Madras (1955, **32**, 593). He poured scorn on the idea of providing students with a modern version of atomic structure and 'working backwards' from this model to explain a wide range of chemical reactions and properties. If the historical sequence of development, which is also the sequence of argument and proof, is liberally adjusted, how much will the teaching of chemistry also foster scientific method and scientific outlook? These are not objections to be dismissed as diehard obstinacy. When at the British Association meeting one speaker said that the rational approach should be preferred to the historical approach, the real meaning of the word 'rational' was surely being discarded. The historical sequence can be followed without cumbersome attention to the periods of stage-by-stage controversy; it is still lengthy even then, but should we expect the pace of youthful assimilation to be faster? The unifying virtues of modern electron theories for reactions and valencies will flourish in better-prepared soil if they are introduced at a late stage—in final sixth-form work or even as late as in the university courses. What real point is there in new theories if the limitations of older and simpler theories cannot first be appreciated?

In our own view the real trouble is that a reasonably thorough education in modern chemistry cannot now be given in the period of student-years hitherto assumed to be sufficient. A pint cannot be put into a half-pint pot. Yet any acceptance of this view must reduce the output of graduates for some time and perhaps permanently. Every commentating voice deplores specialization, but how in reality can it be avoided? Will good industrial chemists emerge from sixth-form and university courses that increasingly concentrate upon modern atomic or electric theory? This policy seems far more likely to produce a hierarchy of research chemists, with most of the accent upon pure research. For each chemist of this kind, we need four or perhaps six of a more broadly practical kind; also, unless the human nature of students has greatly changed, only about one in six or eight is likely to have a suitable temperament and outlook for a pure research career. There is only one ultimate solution—the education of a chemist must take two years longer. As long as the accepted formula of two sixth-form and three university years remains, there must be dangerous compromises, hazardous omissions, and premature specializations.

Notes & Comments

Observation Post

IT IS reported in *Chemical & Engineering News* (1956, **34,** 147) that the Armour Research Foundation of the Illinois Institute of Technology is about to establish a listening post in Europe for keeping watch on scientific and technical developments. A small staff of chemical engineers will review publications, patents, attend society meetings, visit trade exhibitions, etc. Groups of four non-competing US firms with common interests in specific materials or process-types will be sought as sponsors, and each group is likely to have its own staff-member at the European observation-post. The interest of medium-sized rather than large US firms is being sought, as practically all of the large organizations have already made arrangements for European observation. Indeed there was recently formed in London a dining club which consists of these American liaison-intelligence officers. The cost for a supporting firm is estimated at about $8,500 a year, a fairly reasonable price.

Different Outlook

THE project is said to have been sanctioned by US Government departments and it is reported as being favourably received by European opinion. As to the latter reaction, of course, much will depend upon the type of observer chosen. The no-man's-land of industrial technology between initial research and eventual release is a sensitive field to explore. A good deal of tact and restraint is required if an impression of 'snooping' is to be avoided. A somewhat ethical or professional approach will be needed; also, interchange of ideas so that the value of the observation post has a two-way character will act as a lubricant. The group-nature of the project, together with the fact that it will be managed by a research institute, should ensure these qualities. Nevertheless, the first of the few observers will probably need more patience in their make-up than the US norm; they are bound to find that industrial secrecy is considerably more zealous in Europe than in their own country. Their fellow countrymen already holding similar jobs soon learned this for themselves if they had not been previously warned by predecessors. As a matter of fact most firms insist that their observers be allowed to remain over here for a period of not more than three years; a longer period, it is believed, would ruin the morale of any conscientious man. The observers based in London, Paris, Frankfurt, Dusseldorf, Zurich, Luzern, Geneva and elsewhere—as well as the many who have roving commissions but who work from the US—appear to have been hand-picked not only for scientific knowledge and ability but for tact and personality. If the new undertaking chooses its staff with the same care it need have no fear about the succes of the venture. It is a pity that more British firms don't establish listening posts in America for they can save not only time but money.

US Farm Policy

THE new US farm policy stated in exceptional detail by President Eisenhower in his message to Congress may have repressing effects upon most agricultural chemicals there. Crop surpluses have been piling up in the post-war years at a greater rate than home or overseas disposals; the accumulation point of no return has been reached. It is now costing about $1,000,000 a day for storage costs alone. What is called the 'Soil Bank' scheme requires all farmers to make voluntary and sizeable cuts in their cropland acreages for wheat, cotton, corn, and rice. In return for these cuts they will receive payment certificates valued at an unstated percentage of the normal yield value for the withdrawal acreage; these certificates will be cashed or paid out in the form of existent surplus commodities. In short, the Government will pay farmers for producing nothing on a part of their land. Also, land that is not wholly suitable for arable cropping but has been so

used in wartime and post-war farming is to be converted into forage land or forestry with the Government subsidizing conversion costs.

Implementation Likely

THERE seems small doubt that this new policy will be implemented; the farmers would be in a far worse situation if the Government were to unload even a tenth of their embarrassing stockpile of past surpluses. It must inevitably reduce fertilizer consumption —good arable acres being kept in fallow reserve with Government help in costs will not require much in the way of plant-food dressings. Even the land that is converted into pasture or woodland will require only small amounts of fertilizer compared with normal arable crop needs. With the US fertilizer industry geared to high annual tonnages any recession in demand will bring fierce competition. European nitrogen has been steadily selling to America in recent years; this dollar opportunity may become considerably tighter. Sales of pest control and disease control products will also be affected with less crop acreage to be protected. Cotton growing has certainly been a good market for these substances, though their use on the other three major 'Soil Bank' crops has probably been more casual. Manufacturers of these products in America may well intensify their export selling programmes to try to gain abroad what they must lose at home. However, these are not consequences to be felt with full impact at once; they will make themselves gradually apparent as the cropped acreages decline. Although farmers will be paid for not cropping, manufacturers of essential farming commodities will not be paid for not selling.

Canadian Doubts

CANADIAN expansion has been so vigorous in the past 15 years that non-Canadians can hardly visualize room for doubts or criticisms. But it may well be the healthiest symptom of Canada's great surge of prosperity that she is extremely self-critical. She has, of course, the great advantage of history—her industrial revolution is taking place late, long after those of other countries, and she can learn from the recorded errors and omissions of others. The foundation of modern Canada's boom has remained unchanged—the output of her primary industries, or raw and semi-refined materials rather than refined and manufactured commodities. This has periodically produced outbursts of self-criticism. Another strong outburst is taking place now, despite the fact that Canada's best marketing prospects still lie in producing and selling primary goods. The argument, as presented by the president of one of Canada's large chemical firms, is one of long-term effect. Primary production must have its fixed limits, being based upon finite resources; and at any one time the market for primary materials is also limited by external demand. Secondary production is relatively unlimited, expanding by the application of science and new ideas, and able to create its own new markets for new goods. In the long run Canada's overall expansion must be limited if primary output continues to be developed at the expense of neglecting secondary production. From Canada's own viewpoint this may indeed be right; from the viewpoint of world trade, it may be rather less palatable. If Canada ceases to be as ready a market for manufactured goods, countries taking her primary exports may be less able to find the dollars to buy from her.

Investments Cause Concern

AT THE same time Canada is expressing renewed concern about US investment in, and controlling ownership of, her expanding industries, especially those of a chemical nature. Up-to-date figures once again show this trend for US dominance, but the reality is bigger than statistics. Over the period 1947-53 the US share in new chemical investment is as high as 28 per cent. But most of this new investment is specific, bringing with it control of companies. Other countries' investments, notably those of Britain, are spread, scattered holdings that do not carry control. The greatest apprehension of all is concerned with Canada's oil industry, in which US investment has something above a 70 per cent share.

New Laboratories on Show

Open Day at Brotherton's Research Department

AN open day was held on 11 January at the central research laboratories of Brotherton & Co. Ltd., Leeds. An opportunity was given for the Press and visitors to inspect the new wing which has recently been added and to see some of the work carried out by the company.

The firm of Brotherton & Co. Ltd., founded in 1878 by E. A. Brotherton, first Baron Brotherton of Wakefield, is now a large chemical undertaking with works at Birkenhead, Leeds, Birmingham and Wakefield. The first products of the company were derived from by-products of the coal gas industry. Thus at the first works at Wakefield ammonium sulphate was manufactured from ammonia obtained from gas liquor from the local gas works, while later it became possible to obtain pure ammonia solution by a process of distillation.

In 1893 a chamber sulphuric acid plant was operated at Birmingham employing as raw material spent oxide obtained from gas works in that area. The intervening years have seen considerable expansion into other spheres of chemical manufacture, particularly that of reducing agents such as sodium hydrosulphite, at, for example, the Mersey Chemical Works near Birkenhead, which was acquired in 1918. Now, therefore, in addition to being producers of ammonia and many of its salts and of sulphuric acid, the firm manufactures sodium hydrosulphite, sodium formaldehyde sulphoxylate, hexamethylenetetramine, liquid sulphur dioxide, sodium sulphite, bisulphite and metabisulphite and a range of dyestuffs.

The research activities of the company were centralized at Leeds in 1945, and on 23 October 1947 the late Mr. Charles F. R. Brotherton formally opened new and completely self-contained laboratories situated off Kirkstall Lane, Headingley, Leeds, about three miles from the centre of the City. Owing to the difficult circumstances existing at that time, it was necessary to adapt, considerably modify and expand an old building, previously used as a hosiery dyeing factory. The new chemical laboratories, workshop, pilot-plant shed, library and offices having a floor space of approximately 10,000 sq. ft. which then arose were excellently furnished and equipped and have served admirably during the past eight years.

The considerable expansion of the company which is now taking place immediately called for greater research and development activity, with the result that it was decided to reorganize and expand the research department. A new wing, of about 8,000 sq. ft., was commenced in October 1954 and has now been occupied for some two months

The new wing at the central research laboratories of Brotherton & Co. Ltd., Leeds

Laboratory No. 7

or so. The architects were Mr. V. Bain and Mr. W. H. Crocker and the main contractor was R. M. Thompson Ltd. of Leeds.

The new wing, consisting of a steel-framed structure, filled in with red facing brick and artificial stone, adjoins the east side of the existing building. The structure is such that if and when further expansion of the premises becomes necessary, a further floor may readily be added. It was so designed that the joining up of the new and old premises could be done with the least amount of disturbance to the old department. The existing laboratories themselves were not disturbed in any way.

On the ground floor are two spacious and well-equipped workshops, one for metal work and one for woodwork. The old workshop adjoining then became a large store for chemicals, apparatus and equipment, since existing storage accommodation had become much strained. The new store is well provided with racks and has a bay to serve as a wash-up department and a storekeeper's office The workshops are well able to serve the needs for constructional work in most materials for the laboratories and are intended to meet most calls for maintenance work throughout the building.

On this floor are also situated two laboratories for use by the technical advisory service section of the company's sales division. One of these is furnished in the normal manner as a chemical laboratory, the other, fully tiled on walls and floor, with covered cast-iron channels for drainage, has no fixed furniture and is intended for accommodating small-scale machinery, such as is used in textile processes. An ample set of points for services such as water, hot and cold, electricity, single phase 15 amp and three-phase 50 amp, is situated at approximate intervals around the walls of this latter laboratory. Administratively, these laboratories are part of the research department, but their work is controlled by the manager of the technical advisory service, Mr. R. J. Hannay, a well-known figure in the dyestuffs and textile industries.

The kitchen and dining room adjoin, but access to them can only be reached by leaving the main building through a glass covered way. The kitchen, all-electric, is excellently equipped for serving about 30 main meals per day.

On the upper floor are situated the new, main chemical laboratories which are, therefore, in close proximity to the four chemical laboratories, library etc. of the original building. Also on this floor are offices for the research manager and the secretary and a conference room (20 ft. × 20 ft.), furnished in oak, which already has gained the appropriate second name, the 'classroom'. Two laboratories (20 ft. × 22 ft.) are connected by a common balance room and laboratory office. The first of these is furnished as a chemical laboratory with wall benches and one island bench and set of fume cupboards. The other is furnished as a physical chemistry laboratory, with wall benches and two central tables.

This laboratory is adequately provided with glass fronted cupboards for instrument storage, but has only one small fume cupboard. The aim of this laboratory is to

relieve the chemical laboratories from the necessity of giving so much bench space to the storage of large instruments and, of course, to give better working conditions for delicate instruments.

Already installed here are a Hilger Uvispek and flame photometer attachment, a Tinsley polarograph with numerous accessories. A considerable collection of ments Ltd.) with Honeywell-Brown recorder, a Spekker, microscope and accessories. A considerable collection of electrical measuring instruments and meters is held in this laboratory.

Finally, a large laboratory 42 ft. × 24 ft. with balance room and office adjoining is furnished in the conventional way, wall benches, fume cupboard assembly, and two island benches. This laboratory houses the team for process and analytical research.

The services supplied to laboratory benches include hot and cold water, electricity (single phase), gas, compressed air and nitrogen (this because of the handling in the laboratories of so many substances sensitive to atmospheric oxidation). Waste lines are in lead pipe. All main service lines are carried through ducts forming a false ceiling in the main ground and upper floor corridors. All services can be independently controlled at each individual laboratory or workshop. The heating of the building is by hot water with radiators on the ground floor, but ceiling heating (Frenger panel ceilings) is used on the whole of the upper floor. The original boiler room of the old building has, therefore, been enlarged and new automatic oil fired boilers installed, one for domestic hot water and one for space heating. It will be appreciated that the important rooms and laboratories, being heated in the above way and because of the method of introducing the services, are unusually free of obtrusive pipes and appliances.

Laboratory walls have been entirely covered with off-white gloss tiles, but colour has been introduced in an up-to-date way via the ceilings, one of which, for example, is Brunswick green, another cherry red and another sunshine yellow. Generally, woodwork has been brightly coloured and walls of corridors and other rooms are in contrasting and interesting colours. Electric lighting throughout has been carried out almost entirely by means of tungsten bulbs in contemporary fittings of varied design.

All the company's research work is carried out at Kirkstall and one of the primary objects is the discovery of new and improved products. The research department is also responsible for the investigation of improved processes for the manufacture of existing products. This function brings the members of the staff into close contact with the operating plants.

The scientific staff of the research department consisting of 17 graduates has been divided into two sections: (1) new products research under the leadership of Dr. G. M. Gibson, occupying the three laboratories of the old building together with its pilot plant shed and (2) process and analytical research under Dr. W. Furness occupying much of the laboratory accommodation of the new

A corner of the dining room

wing. The department is headed by Dr. W. Cule Davies, research and development manager, who came to Brotherton's in 1945 to organize the centralization of the research of the company at Leeds. He also controls a small staff and laboratory engaged on work on development projects.

No Routine Analytical Work

In these various sections laboratories are provided for organic chemistry, physical chemistry and analytical chemistry. In the old building are also provided several ancillary sections and rooms, such as library, pilot-plant shed, dark-room, tower for accommodation of long distillation columns and commodious stores. No routine work is carried out in the analytical laboratory. It is responsible for the study of new analytical methods and for the standardization of methods such as are used in the routine laboratories at the works. In addition, it is engaged on small investigations arising through the technical service department.

In its 10 years of existence the department has had many successes and the new wing provides strong evidence that its value is appreciated. A considerable study has been made of some of the principal processes employed at the company's works, and as a result, for example sections of the hydrosulphite process have been modified and improved while plant has been installed for the purification of by-product ammonia. New products have been extensively investigated and two are now being marketed, sodium formaldehyde bisulphite and ammonium thiosulphate. A new series of organic sulphoxylates, for example cetyltrimethylammonium formaldehyde, sulphoxylate, which is soluble in many organic solvents, has been discovered (BP 727,472) and is now being developed.

In the field of uses for products and of customer service, a process for improving the quality of china clay using sodium hydrosulphite has been developed (BP 672,555). Further in this connection, and in conjunction with the manager of the technical service department, important investigations on the techniques of metachrome dyeing of wool (Hannay, Major & Pickin, *J.Soc.Dyers & Colourists*, 1952, **68**, 373; Hannay & Major, *ibid.*, 1953, **69**, 195) and on the chemical reactions which take place in textile printing when using sodium formaldehyde sulphoxylate (Hannay & Furness, *J. Soc.Dyers & Colourists*, 1953, **69**, 596) have been carried out.

The central research department has gained a considerable reputation for its work in the field of polarographic analysis (Davies, *Analyst*, 1946, **71**, 49). Noteworthy was a contribution which applied this method to the analysis of commercial hydrosulphites and related compounds (Furness, *J.Soc.Dyers & Colourists*, 1950, **66**, 270). Other interesting investigations in the field have been the polarographic determinations of nitrilotriacetic acid and ethylenediamine tetraacetic acid (Furness, Crawshaw & Davies, *Analyst*, 1949, **72**, 629; Davies & Furness, 'Proc.1st Int. Polaragraphic Congress in Prague', 1951, Vol.1, 25;) and the polarography of the tetrathionate ion (Furness & Davies, *Analyst*, 1952, **77**, 697). Papers on theoretical aspects of polaragraphy have also been published Furness, *Analyst*, 1952, **77**, 246, 345).

It will be seen from the above that members of the research department are encouraged where appropriate to write papers for publication, thus providing added interest and incentive.

Chemical Society Symposium

RECENT advances in the chemistry of colouring matters will be the theme of a symposium organized by The Chemical Society at the Royal Institution, Albemarle Street, London W1, on 2 February. Comprising two sessions, at 2.30 p.m. and 7.30 p.m., the symposium will be under the chairmanship of Dr. R. P. Linstead, C.B.E., F.R.S., in the afternoon, and Professor Sir Alexander Todd, F.R.S., in the evening.

The titles of papers to be presented in the afternoon session are 'Steric Effects in Azo & Indigoid Dyes' by Wallace R. Brode (Washington); '*Cis- trans* Isomerism in Azo-dyestuffs' by R. H. Peters and E. Atherton, and 'Synthesis of Azaporphins & Related Macrocycles' by J. A. Elvidge, Ph.D., A.R.C.S., A.R.I.C.

In the evening session two papers will be presented. The first, 'Synthetic Carotenoids' by six Swiss chemists, H. Lindlar, Dr. O. Isler, M. Montavon, R. Rüegg, G. Saucy and P. Zeller, will be read by Dr. Isler. The second paper, 'Modern Theories of Colour' will be presented by Professor M. J. S. Dewar, M.A., Ph.D.

Ozokerite — Origin, Refining & Characteristics*

by M. A. LAPIDUS
(Raffinerie Tiscco, Dobigny, France)

OZOKERITE is a fossil wax recovered from deposits which are often found in the vicinity of oil fields. Its name is derived from the Greek 'ozo' (odorous) and 'kerite' (wax). In the middle of the last century it was discovered in Galicia and described as 'a mineral wax with properties resembling those of beeswax'. Soon afterwards ozokerite was mined in the Carpatho Mountain range and in some locations around the Moldava River—all of which were, at that time, parts of the Austro-Hungarian Monarchy. They now belong to Poland and Czechoslovakia. Subsequently, Russia started exploiting her own deposits in the Caucasus (near Baku) and on the Tchekele Islands.

Other deposits were found in Turkestan and Iran (near Fergona), Roumania (near Ploesti), Scotland, Northumberland and Wales. Later on the United States developed its own ozokerite mines in the State of Utah. However, some of the mines mentioned above have been abandoned because of growing difficulties in exploitation.

Two theories for the formation of ozokerite exist in contradiction to each other.

The English theory states that the fossil wax is a residue formed by the decomposition of algae. This hypothesis is based on the work of Kramer and Potonie who maintained that the raw material of mineral oil and related products was an abundant growth of algae which continued throughout the prehistorical and historical ages and goes on uninterruptedly in swamps and marshes.

Heat & Pressure

Under the action of heat and pressure which are present to a small degree but which act continuously throughout the ages, these algae swamps are supposed to have undergone putrefaction and chemical alterations, which finally led to the formation of a fossil wax. This was, at a later date, broken down further until it became an intermediary in the natural formation of petroleum oil. The same group of scientists assumes that all oil deposits exist as the result of natural decomposition processes, and that their underground formation can be supposed to continue even in our time.

Legg and Wheeler found that the wax originating from fossil plants consists of oleic acid and saturated hydroxy-aliphatic acids. They also compared ozokerite with the wax formed by some plants of our modern flora (such as *agave regida L.*, and the sisal hemp plant) and noted a startling similarity in composition. The wax recovered from the *agave regida* cuticle includes 85 per cent alcohols, principally montanyl and mellisyl alcohols. Upon extraction with petroleum ether, brown algae—such as the *alaria crassifolis* and 'Kyel!m'—yielded unsaturated terpenes and hydrocarbons, among which $C_{18}H_{30}$, $C_{20}H_{34}$, and $C_{21}H_{38}$ were predominant.

German Theory

The German theory of ozokerite formation claims that the mineral wax deposits found today are of animal origin. This school of thought insists that all that remains of an animal corpse is the bones and a comparatively small quantity of wax and that, therefore, dead herds of antidiluvian beasts ought to be 'credited' for all ozokerite deposits.

However, after the researches of Thorp and Young, it appears that mineral wax is a product which precedes petroleum oil in formation; i.e. that it is an intermediate compound finally converted into petroleum oil. It is also assumed—after the theory of Engler-Hofer—that both the solid hydrocarbons and their liquid counterparts originate side by side, as decomposition products of the same primitive raw materials (residual fats and waxes). Their oleic acid is supposed to be converted into liquid hydrocarbons, while the solid fatty acids provide the base finally converted into ozokerite. Under pressure caused by the soil

* *Originally published in La Parfumerie Moderne*, 1954, **47**, [42]. *Translated from the French by Margeret Neurath.*

and rock on top and by gases developed through chemical reactions, the petroleum oil (with some inclusion of amorphous ozokerite) flows upward from the depth of its original location, so that it can now be found as an infiltration in the porous and brittle materials filling cracks in the rock.

Because the liquid oil can more easily penetrate the soil, it flows farther from its sources and accumulates in deposits away from those of the slower-flowing ozokerite. At the same stage of development it may happen that crystalline paraffin and amorphous ozokerite—both of which are present in the raw oil—become separated. Because paraffin is more soluble, it is better equipped to participate in the oil flow than is the mineral wax which does not dissolve in it.

Thus, ozokerite is virtually filtered through porous rock—mainly clay—and this is why its colour components are kept away from the surface, the streaks of naturally-filtered wax being pale brown or green in colour, while the 'lepwax' which cannot pass the harder clays and shales, is saturated with all impurities and is of a darker and greasier appearance.

Molecular Fillers

It is thought that in the geological ages the slate clays and soft shales took the part of modern condensation plant and acted as molecular filters. According to this hypothesis small hydrocarbons have been converted into larger ones by some kind of polymerization process, yielding a residual wax and, sometimes, small quantities of oil. The colloidal clays sticking to ozokerite recoveries are salty, which hints of their formation at an advanced geological age—probably the carboniferous period.

In most of the mineral wax deposits an intermediary between petroleum oil and ozokerite, the 'kindebal', is also found. It greatly resembles 'pipe line wax', a dark substance settling in oil conduits, which was previously mistaken for a mixture of oil, paraffin, and asphaltic compounds. The theory which says that mineral wax and oil originate from the same source can also be backed-up by a check on the optical properties of both products. The solid components of mineral wax are optically inactive; yet its oily fractions and the petroleum oils themselves are slightly dextrorotatory. Finally, the close relationship of mineral oil and wax is indicated by the presence of amorphous, high-melting components in ozokerite which have, on innumerable occasions, been detected in petroleum oil derivates as well. One of these is the sludge which settles in storage tanks, and the 'pipe line wax' already mentioned, which have, in more recent times, been extracted systematically, for industrial utilization.

Some time ago it was generally assumed that crystalline paraffin originated from the lower carbon numbers, and amorphous ceresine from the higher carbon numbers of the same hydrocarbon compounds. Conversely, Marcusson supported the hypothesis set up by Zaloziecki, according to which ozokerite is formed with *iso*-paraffinic amorphous hydrocarbons as starting material, while the crystallizing paraffins are derived from normal paraffinic hydrocarbons having a straight chain. In effect, the molecular weight, refractive index, specific weight and, after melting, the viscosity of ozokerite are higher than the same indices of ordinary paraffin.

Fuming sulphuric acid reacts with ozokerite at the boiling temperature of a double-jacketed kettle, while paraffin, under the same conditions, is only slightly attacked and darkened. The reaction is pronounced and foaming, even with sulphuric chlorhydrine. Large quantities of gas develop in this instance, leaving a carbonaceous sediment. These features are apt to strengthen the hypothesis that hydrocarbons with a ramified chain are present in ozokerite.

Hydrocarbons

The presence of hydrocarbons with a long lateral chain in ozokerite is improbable, because in this case acids would be recovered upon oxidation with permanganate in a pyridine solution. In effect, after this kind of treatment, ozokerite is recovered with an almost unchanged refractive index. Further, nitric acid, which vigorously reacts with ozokerite, will yield no nitrated compounds that would indicate the presence of naphthenes.

Under distillation, ozokerite is broken up into paraffinic hydrocarbons of a lower melting point, and into liquid hydrocarbons and olefines of low molecular weight—all of which indicates the presence of *iso*paraffins in ozokerite.

Low-melting ozokerites include also a small amount of crystalline paraffin. Their

oxide content is indicated by their dark colour.

Ozokerite is found in streaks having a diameter of about 30-40 cm. The deeper the streak lies, the harder is the wax. Originally, pits were dug to mine the wax; at present ozokerite is mined by the same methods as other materials, i.e. through galleries up to 300 and 400 metres in depth.

The product shipped from the mines is freed from the adherent dirt, melted, decanted and poured. As indicated before, the heavier the soil on top, the darker is the mineral wax recovered and the higher its content in asphalts. Ozokerites are classified by their melting points which range from 60-62°C for soft varieties (Russian D and E material) up to 82-84°C for hard qualities (Russian A', A, B and C). In the USSR these waxes are substituted for candelilla waxes and Utah products.

Raw ozokerite is rarely sold because it holds an excessive quantity of asphalt. The material supplied by the mines is melted in the presence of a small percentage of sulphuric acid, decanted and cooled, to recover a quality known as 'Hard Green'.

Raw ozokerite is amorphous and has a specific gravity of 0.900-0.907 at 15°C. Refined material has the same structure, but its specific gravity ranges between 0.910 and 0.920 at the above-indicated temperature.

American ozokerites are hydrocarbons which differ from the European products in composition and mechanical characteristics.

In many instances ozokerites resemble microcrystalline petroleum waxes. However, they are products of Nature, while the microcrystalline waxes are industrially prepared in the course of oil distillation.

The maximum recovered in Galician ozokerites was above 20,000 tons annually, but today's production is far below this figure.

Quality of Sample

To check on the quality of a sample, its solidification point has to be determined, and, subsequently, its melting point and its absorption in a mixture of oils.

At Tiscco laboratories the solidification point is found by a simple procedure. A ballpoint thermometer is heated to 100-120°C and a slice of ozokerite placed on its ball. A droplet forms and attaches itself to the base. Then the thermometer is cautiously turned around so that the liquefied ozokerite will flow around its base and yet stay suspended to it. From the moment of solidification onwards, the droplet attaches itself firmly to the thermometer and rotates with it. The temperature shown at this moment is the solidification point, and by adding 2°C to this, the accurate melting point is found. This procedure is recommended for its simplicity.

In case of doubt the melting point is determined through a standardized method such as the capillary tube, but we have got the best results with the method of Chercheffsky. The apparatus used consists of a receptacle of water, on the edges of which an agitator of six to seven mm. diameter has been placed. Around its pin a brass wire is wound; its tapered end is sent back and upward by 90°. Small cubes of ozokerite (about five mm. in length) are now cut out, strung over the tip of the brass wire and set on it so that they cannot touch each other. Now the water is slowly heated and a note made of the temperature at which the small cubes leave the wire and rise to the surface. Thus, several tests can be made simultaneously.

Double Jacket

In precision tests a double jacket is employed and the intermediate space filled with sulphuric acid, which helps exclude sludge formation and permits high uniformity of heating.

A modification of the Pohl method can also be employed. The outside of a good thermometer is coated with a thin layer of ozokerite by dipping it into the melted wax; this coating is permitted to cool and the excess material is scratched off with a knife, so that only a ring a few millimeters in height is left near the middle of the thermometer. This is then placed in a test tube with a stopper that has a centre hole and chamfered perimeter. The entire assembly is dipped into a receptacle filled with water and serving as a jacket; upon slow heating the moment is watched for when the ring becomes transparent, loses its shape, and glides toward the end of the thermometer. The temperature shown at this moment is the melting point.

We have already mentioned that raw ozokerite, cleaned of its impurities, is refined by a first step of treatment with sulphuric acid, and thus converted into 'Hard Green'. This quality is placed in casting moulds, heated to 110-120°C under direct fire and thus freed from the last water traces.

Under continuous stirring concentrated sulphuric acid is now added slowly, or, instead, 10-20 per cent by weight of the ozokerite, in sulphuric anhydride. A tarry, viscous precipitate forms which carbonizes as heating proceeds and is finally converted into charred dust that accumulates at the bottom of the moulds.

Practically speaking, 20 per cent of the material treated this way is lost by conversion into tar. The remaining ozokerite is decanted, neutralized and passed on to the decoloration plant. Decoloration is effected with Fuller's earth or activated carbon. After decoloration the wax is placed in filter presses and washed to remove the last acid traces, after which step it is poured into moulds.

Probing

In cases where it is hard to discern between natural ozokerite and American microcrystalline waxes, probing is easy to achieve with sulphuric acid applied to one or other of the melted materials. In the presence of the acid, ozokerite forms a tarry precipitate and the fraction above it has yellowish spots. In mineral waxes, however, the acid causes calcination and the entire mass darkens without any decoloration to be noticed.

Some time ago America also produced ozokerite; however, of 17 mines, only one proved of sufficient commercial interest to justify its exploitation for any period of time. This was the deposit in the State of Utah, source of 'Utah-wax'. This mine, however, also proved a losing business as time went on, because of the depths to which it was necessary to descend; and when floods added to the technical difficulties, work had to be stopped. Yet, research on ozokerite recovery continued and some conclusions have been drawn.

Where the oil flow was abundant, the oil had been found to serve as vehicle for the solid fatty acids which, at a later stage, form ozokerite and deposit it either in the pipe lines or storage tanks. On the first stay which the author made in America he asked his friends to do what had always been thought impossible: to recover the ozokerite carried along in these oil conduits; the more because America is, at present, not mining any ozokerites from solid deposits.

At the Warwick plant, five groups of technicians came to the conclusion that, in the United States, ozokerite can be recovered from thousands of tons of magma precipitated at the bottom of tanks and pipes—a product composed of oil, paraffin and ozokerite. The problem at hand was to fractionate these materials and extract each of them separately. Some large laboratories started this research and the works of Chanute-Kansas constructed plants with an extraction capacity of about 30 tons per day.

The magma, or 'Gatsch,' is predistilled to remove the volatile oils on the spot, and eliminate the cost of shipping compounds that have to be discarded anyway. The condensate is shipped in tank wagons and—at the Chanute plant—treated by heat and chemical action.

The first task to achieve is removal of the tars by acidification. The tars are charred and a waxy material recovered which is neutralized. The yield is in the vicinity of 75 per cent of the matter fed to the plant, and the product recovered is a mix of ozokerite and paraffin with an oil fraction. To separate the ozokerite from the paraffin-oil mix the product is distilled under vaccum at a predetermined temperature. The paraffin and oil are evaporated and condense upon cooling to form a crystalline, soft mass which is of a pale yellow—almost white—colour.

In the bottom of the distillation plant, about 50 per cent of the charge is recovered as a greenish-black substance which—in structure and characteristics—equals the best green mineral waxes known before the first World War; i.e. the solid ozokerites found in Poland, Roumania and Russia.

Mekonozo

The green ozokerite must, again, be refined to produce yellow ozokerite, known as Mekonozo. The yellow substance, consisting of ozokerite and oil traces, has a high penetration index and must be chemically treated to remove the oil and supply it with a low penetration point and a high melting point. It is washed with solvents in filters placed under a high vacuum, with the result that two products are recovered: a crystalline wax which is free from oil, and the oils and solvents. These are fractionated by distillation and the crystalline wax is washed once more, and distilled to eliminate the last traces of solvent. Finally, the yield is bleached by routine procedures and an ozokerite made available which has all the qualities and characteristics of the genuine, natural wax extracted from the mines.

Just like the ozokerites, the microcrystalline waxes have, since 1939, become standard raw materials in many industries, and predominantly so in the perfumery trade. The varieties of these waxes differ as concerns their melting points, plasticity, grades, penetration indices etc.

Over 1,000 tons of 100 per cent mineral, microcrystalline waxes are now produced annually in the United States. These are neither emulsifying nor saponifying and have found their uses in oily solution and dispersion. Attempts have been made to render them emulsifiable. The Warwick Co. placed 'Cardis' on the market, which is a microcrystalline, high-melting wax that has been oxidized.

If this compound is heated to a temperature 75-80°C above its melting point in the presence of a metallic catalyst and soap and under a current of oxygen, decomposition results and a burnt odour develops.

No oxidation occurs in petroleum waxes upon heating to their melting point; but under continuous heating the hydrocarbons will degrade by oxidation, to such an extent that considerable quantities of acids and ethers are recovered.

If the temperature is held at least 30°C above the melting point, only slight oxidation results even after a few days' heat application. At a temperature at least 60°C above the melting point, decomposition proceeds rapidly enough to make traces of fatty acids appear on glass apparatus in 24 hours. In a microcrystalline wax the melting point is lowered by about 0.6°C per day upon continuous heating to 121.1°C.

Sometimes antioxidants are added to microcrystalline waxes; such as β-oxyanthraquinone, ditolylamine, benzoic acid etc. It has been found that waxes treated with silica gel will definitely resist oxidation.

We have attempted in this paper to outline the characteristic properties of the mineral waxes now available. The quality range produced makes them eminently suitable for the cosmetics industry, the production of paper coatings and packaging materials, and a large number of new industrial applications.

Shell to Market Silotex

SODIUM metabisulphite which was introduced by Brothertons of Leeds, Yorkshire, for silage making and sold under the name of Silotex is now being marketed exclusively in the UK and Ireland by Shell Chemical Co. Ltd. Last year 500 tons was distributed in the UK to make 140,000 tons of silage. Brotherton's production capacity will be increased fourfold when a new plant, now building, is completed at Bromborough, a few miles from the Shell chemical plant at Stanlow, Cheshire, from which is obtained the liquid sulphur required for the manufacture of Silotex.

Silotex is designed to preserve grass when cut by sterilization without fermentation, but should fermentation occur the production of the butyric acid responsible for the characteristic smell of fermented silage is inhibited. As sodium metabisulphite requires no time for wilting and heating-up, the crop can be ensiled immediately and any loss of carotene and protein is minimized. The liquid sulphur used in the production of Silotex is derived from petroleum and is free from arsenic and selenium. In 1954 US sales of sodium metabisulphite for making silage totalled 8,000 tons. Last year sales rose to 25,000 tons.

Chipman Chemicals Move

A DECISION TO establish its central administrative offices in Hamilton, Ont., was announced at Montreal recently by Chipman Chemicals Ltd. Mr. J. H. D. Ross, general manager of the reorganized pesticides firm, said that the new accommodations, to be located at 519 Parkdale Ave., will house the headquarters of the company's central sales, development, technical service, railway and production, as well as the eastern Canadian sales office. The new offices will open on 1 February.

Mr. Ross also announced the appointment of Mr. J. G. Hastings as general and eastern sales manager, Mr. L. M. Godfrey as development and technical service manager, Mr. W. P. Dean as railway service and production manager and Mr. W. F. Crutchlow as controller. Messrs. Hastings, Godfrey and Crutchlow were previously employed with the C-I-L agricultural chemicals division, Montreal.

Hamilton was chosen as the headquarters of the company because it is considered the geographic centre of the largest pesticides consuming market in Canada. Two district sales offices have been established—one in Winnipeg to serve western Canada, and the other in Hamilton to serve eastern Canada.

Chemical Exports for December

Little Change from Previous Month

TOTAL chemical exports for 1955 amounted to £232,818,505, an increase over the values for 1954 (£204,542,711) and 1953 (£178,050,855).

Principal importers were still Australia and India, both spending more than £1,000,000 in Britain. There were no startling changes compared with the previous month, but the total value of exports decreased by about £1,000,000. An examination of the figures for December 1954 shows that, with few exceptions, British markets have changed little in the last 12 months. The most notable decline is in exports to Argentina, £257,682 last month compared with £1,401,526 for December 1954. On the other hand exports to the Netherlands Antilles have increased from £65,584 in December 1954 to £305,102 last month.

EXPORTS: PRINCIPAL COMMODITIES

	Dec. 1955	Nov. 1955	Dec. 1954
Acids, inorganic (cwt.)	15,883	18,090	14,679
Copper sulphate (tons)	2,472	1,505	1,153
Sodium hydroxide (cwt.)	285,492	316,185	467,119
Sodium carbonate (cwt.)	364,971	450,593	233,813
Aluminium oxide (tons)	1,500	511	11
Aluminium sulphate (tons)	2,645	3,310	2,232
Ammonia (cwt.)	7,800	11,437	12,212
Bismuth compounds (lb.)	25,631	30,634	39,908
Bleaching powder (cwt.)	23,993	25,728	25,346
Hydrosulphite (cwt.)	3,508	7,042	10,558
Calcium compounds inorganic (cwt.)	24,277	26,871	25,701
Lead compounds inorganic (cwt.)	8,679	6,358	6,095
Magnesium compounds (tons)	1,499	2,485	2,025
Nickel salts (cwt.)	6,705	5,052	4,807
Potassium compounds (cwt.)	4,269	4,391	4,941
Acids, organic & derivatives (value in £s)	92,940	113,743	100,474
Ethyl, methyl etc. alcohols (value in £s)	81,001	97,400	131,332
Acetone (cwt.)	12,749	12,316	15,721
Citric acid (cwt.)	2,728	3,073	3,192
Sulphonamides unprepared (lb.)	93,807	77,232	127,371
Dyestuffs intermediates (cwt.)	6,607	6,165	7,955
Total for elements & compounds in £s	**4,416,729**	**4,404,364**	**4,636,161**
Coal tar (tons)	6,776	13,749	8,223
Cresylic acid (gal.)	257,611	252,780	340,522
Creosote oil (gal.)	979,988	1,099,999	3,400,417
Total for tar products in £s	**252,388**	**305,534**	**440,950**
Indigo, synthetic dyestuffs (cwt.)	2,297	964	6,606
Total for synthetic dyestuffs (cwt.)	**18,044**	**17,532**	**35,275**
Total for paints, pigments & tannins in £s	**1,860,432**	**2,084,694**	**1,893,731**
Total for medicinal & pharmaceutical products in £s	**3,364,351**	**3,426,029**	**3,320,247**
Total for essential oils, perfumes etc. in £s	**2,189,902**	**2,542,101**	**2,273,401**
Ammonium nitrate (tons)	464	42	945
Ammonium sulphate (tons)	6,409	13,122	41,026
Total for all fertilizers in £s	**189,227**	**308,266**	**863,631**
Total for plastics materials (cwt.)	**155,860**	**149,260**	**156,492**
Disinfectants etc. (cwt.)	12,231	17,735	18,456
Insecticides, fungicides (cwt.)	49,329	31,061	32,680
Rodenticides & weed-killers (cwt.)	7,966	5,738	11,055
Lead tetra-ethyl (gal.)	393,957	451,411	308,557

VALUE OF EXPORTS IN £s: PRINCIPAL BUYERS OF CHEMICALS

	Dec. 1955	Nov. 1955	Dec. 1954
Australia	1,878,099	1,367,823	1,990,441
India	1,511,016	1,239,077	1,601,477
South Africa	940,995	892,251	956,944
Netherlands	727,024	762,971	635,569
Canada	650,925	940,184	633,622
United States	629,490	565,280	748,448
Italy	626,809	639,633	535,861
Sweden	587,803	582,720	560,219
New Zealand	564,587	753,831	588,273
Eire	560,839	641,422	522,526
Western Germany	555,771	543,621	385,975
Pakistan	505,239	485,352	627,170
France	503,605	464,544	688,122
Gold Coast	452,130	422,499	443,724
Belgium	408,821	493,413	362,937
Nigeria	376,046	482,229	430,624
Singapore	367,841	425,603	396,182
Denmark	326,258	388,454	355,540
Indonesia	312,423	282,632	431,495
Netherlands Antilles	305,102	187,154	65,548
Egypt	301,795	418,429	355,584
Malaya	295,708	367,778	351,036
Finland	291,202	239,841	248,801
Hong Kong	259,916	250,650	356,858
Burma	259,394	254,433	120,652
Argentina	257,682	165,934	1,401,526
Norway	236,260	326,365	290,909
Ceylon	229,518	334,031	333,462
Total value of chemical exports	19,695,706	20,596,605	21,790,894

BIMCAM & Automation

Extension to Industrial Revolution, Says Speaker

SPEAKING at the annual luncheon of the British Industrial Measuring and Control Apparatus Manufacturers' Association (BIMCAM) in London on 17 January Mr. Derek Walker Smith, M.P., Q.C., Parliamentary Secretary to the Board of Trade, said that automation was an evolutionary extension to the industrial revolution and was no threat to the national economy.

The Parliamentary Secretary went on to say that BIMCAM represented a young industry. It now consisted of 35 companies with more than 90 per cent of the productive capacity of the industrial instrument industry in the UK.

The chairman of BIMCAM, Mr. G. A. Edwards, C.B.E., said that the annual production of their industry was worth £20,000,000, a third of which was exported.

Sir Walter Puckey, past president of the Institution of Production Engineers, referred to the achievements of the Soviet Union in the field of automation, which, he said, no-one underestimated. The biggest obstacle we had to face in this country was apathy, he said.

The initial steps in the formation of BIMCAM occurred in 1940 when, in response to a request from the Board of Trade, Mr. W. G. Ardley of George Kent Ltd. formed the 'Meters and Measuring Export Group' in order to encourage exports, allocate raw materials and so on.

In 1944 the habit of co-operation which firms had learnt in the export group led them to decide to form a trade association to deal with a wider variety of problems. Mr. Ardley was the founder and first chairman of BIMCAM, which was the organization set up.

BIMCAM was thought to be a convenient way of describing the industry which manufactures apparatus for indicating, recording and controlling flow, pressure, temperature, level, gas analysis, specific gravity, humidity, conductivity and so on together with many specialized applications.

Mr. Ardley was the chairman of BIMCAM until 1948 when as a token of appreciation for his services to the industry he was elected the first president of the association. The second president is Mr. H. W. Blake, formerly of Tylors of London Ltd., who was in the chair at the luncheon.

The association is the recognized point of contact between industry on the one hand and Government departments and users on the other. In particular, the Association has close relations with the Board of Trade.

The main objects of the Association are:—

(1) To provide a central body to survey and foster the interests of the British indus-

At the BIMCAM annual luncheon. Left to right, Mr. H. W. Blake, president of the Association, Mr. Walker Smith, Mr. L. S. Yoxall, and Sir Walter Puckey

trial instrument industry.

(2) To develop close collaboration between its members and the industries they serve and to encourage the interchange of information in the general interest.

(3) To encourage research and the development of improved techniques and to promote higher efficiency within the industry.

(4) To maintain the highest standards of performance, installation and servicing of British industrial instruments in the mutual interest of users and manufacturers.

Matters relating to prices are rigidly excluded from any part of the association's functions.

The activities of the association vary according to the problems of the day. During 1955 the association has been very alive to the public interest shown in automation. It took part in the display held in conjunction with the conference on the automatic factory arranged by the Institution of Production Engineers at Margate. The association also interested itself, throughout the year, in the related subjects of fuel efficiency and smoke abatement.

A display was held in London designed to show the Press how instrumentation and control could help in cutting down smoke while reducing the industrialists' fuel bill and this was followed by a display in Leeds at which a large number of local industrialists and engineers were present.

The association also collaborated with the Combustion Engineers' Association at a conference on Fuel Efficiency, held during the British Instrument Industries Exhibition at Earl's Court in July. This exhibition was only one of the many promotional activities undertaken by BIMCAM during the year. Another example of these activities was the Buyer's Guide, describing the products of the industry, which was given a wide circulation at home and abroad.

Other association activities included supplying information for Board of Trade negotiators at trade talks, participating in the standardization work of the BSI, co-operating with other trade associations on instrumentation problems and with the Federation of British Industries on general industrial matters, helping members on many commercial problems and keeping them informed of matters affecting the day to day conduct of their business, particularly on export matters.

Seaweed Research

Institute's Successful Work

THE Institute of Seaweed Research, at Inveresk Gate, Musselburgh, near Edinburgh, has been so successful that work on the present scale will stop at the end of June. The Institute will carry on, however, on a smaller scale and with a smaller staff.

This was announced by Lord Bilsland, chairman of the board of management, at a conference in St. Andrew's House, Edinburgh, on 17 January. 'Research has pointed the way', he said. 'It is for industry to utilize the facts and methods and so on which have been worked out.'

In a summary of achievements, the Institute says that since the end of the war a new industry has been built up worth more than £1,000,000 a year, using more than 40,000 tons annually of a Scottish crop which, until a few years ago, was looked upon as worthless.

The Scottish Seaweed Research Association, it recalls, was formed in 1944. At that time no British seaweed was being processed nor had it been since the collapse of the kelp industry 50 years earlier.

The operations of the Association—renamed the Institute of Seaweed Research in 1951—had been directed by an independent board of management, of whom Lord Bilsland had been chairman since the inception and Dr. F. N. Woodward director almost since the beginning.

The Institute points out that it set itself the task of 'assessing the location, quantity, composition, and life history of the seaweeds growing around our shores, and to developing processes for, and assessing costs of, harvesting and the extraction of chemicals.

The report adds that 'the composition of the most common types of brown seaweed found in Britain has been worked out at the Institute in greater detail than in any other country. In fact, more is now known about the composition of sea plants than any land crop, including grass, cereals, or timber.

'Although this work has largely been of a fundamental nature, much information has been derived of value to chemical manufacturers. It has shown, for instance, that for every ton of alginate produced from fresh seaweed, about 2½ tons of other organic and 1½ tons of inorganic chemicals are potentially available.'

LEATHER FINISHES. By J. S. Mudd. A. Harvey, Croydon. 2nd edition. 1955. Pp. 138. 15s.

Some may find in the pages of this book a melancholy reflection of the rapid disappearance of the individual craftsman and his replacement by the process worker backed at one remove only by the scientist. They may, however, draw some limited comfort from the fact that some recipes still in use to-day were known by leather workers in the time of the Pharaohs while the finished leather is still valued and bought by the subjective appraisal of an experienced hand rather than by any scientific criterion.

The book covers every aspect of finishing from the tanning of the original hides to the preparation of the finishes and the measurement of the final colours. The treatment is as a result, rather sketchy in places and the terminology inexact. Carbon black and zinc oxide for example are described as being volatilized on to a cool surface while nitranilines are said to be coupled to β naphthol without any indication of what is implied by this phrase. Nevertheless this is a most valuable handbook on a subject about which there is little general information, for as the author points out the manufacture of finishes continues to remain in the hands of a very few specialist firms.

As an example of the application of modern scientific methods to an ancient craft it will interest a far wider circle of readers than those engaged directly in the leather trade itself.—J. R. MAJER.

THE FIGHT FOR FOOD. By J. Gordon Cook. George G. Harrap & Co. Ltd., London. 1955. Pp. 208. 10s 6d.

The food problems of the world have, in recent years, grown to tremendous proportions. Already more than half the people of the world are getting insufficient food, and the world population is increasing at such a rate that we shall have twice as many people to feed in a generation or two. The extent to which these problems are becoming recognized by scientists can be appreciated, not so much by the virile activities of the Food and Agriculture Organization of the United Nations, as by the number of papers delivered before scientific societies, by exhibitions such as the 'You Versus Pests' exhibition held in London last year, and by developments such as the formation by the Society of Chemical Industry of a Pesticides Group. The number of books written on the various scientific and technical aspects of the subject has also increased enormously of late. But now it is the turn of the layman to become acquainted with the subject. And who is better fitted to instruct the layman than J. Gordon Cook who at one time edited many of ICI's technical pamphlets?

In 'The Fight for Food', which is published in the 'Science for Everyman' series, Dr. Cook describes in non-technical language what modern science is doing to meet the situation. A survey of the chapter headings gives an indication of the wide scope of the book: 'Green Grows the Food', 'Even Insects Must Eat', 'Chemical Warfare', 'When Plants Go Sick', 'Preserving and Protecting', 'Animal Pests', 'Making the Most of Our Food', 'Domesticating the Microbe', 'Chemicals in Our Food', 'The Soil Can Grow More', 'More Food from Well-Bred Plants', 'Animals are Important', 'Floating Farms of Algae', 'Storehouse in the Sea', and 'Synthetic Food and the Future'.

The book is very well written, as one would expect from Dr. Cook, and should appeal not only to the ordinary reader but to teachers, students, and sixth-form pupils. It contains a wide range of half-tone illustrations and the production is good.—P.W.A.

KUNSTSTOFFE. IHRE VERWENDUNG IN INDUSTRIE UND TECHNIK. By E. Wandeberg. Springer-Verlag, Berlin. 1955. Pp. vii + 283. DM25.50.

As indicated by the title this book is designed for the plastics user. The chemistry of plastics or their intermediates is hardly mentioned. The main concern is with processing and applications. The first chapter attempts rather arbitrarily to classify all workable materials such as wood, metal, paper, glass, those derived from natural products and synthetic plastics. It could be omitted to advantage as it has little to do with the main purpose of the book. The next chapter subdivides synthetic plastics into polymerisates, polyadducts and polycondensates which are alternative terms, respectively, for addition polymers, condensation polymers formed without and condensation polymers formed with elimination of a simple molecule. Each is then further divided into thermoplastic and thermosetting.

A very full account follows of the main plastics classes including silicones but largely omitting rubbery materials. The main stress is all along on processing and applications. Consideration of physical properties, mainly mechanical and electrical, occupies much of the discussion. Many diagrams and photographs are given of processing machinery, tests, various products and their applications. There are some large loose sheets containing tables of physical properties and there is an appendix of trade names. The author hopes that this survey will make the manufacturer and designer aware in an easily understandable fashion of the interesting properties of plastics, especially of those likely to be of use to him, and encourage him to discover further uses.—M.C.

INTRODUCTION TO CHEMICAL ENGINEERING. By Walter L. Badger & Julius T. Banchero. McGraw-Hill Publishing Co. Ltd., New York & London. 1955. Pp. ix + 739. 71s 6d.

Many contributions have been made to chemical engineering topics since the second edition of 'Elements of Chemical Engineering' by Badger and McCabe was published in 1936. These are reflected in the new book 'Introduction to Chemical Engineering' now published by McGraw-Hill for the student meeting unit operations for the first time.

The book is written, not as an advanced treatment but is rather designed to give the student a firm foundation for more advanced work. This has involved judicious selection of material concerning the topics discussed.

The book is well-illustrated with 418 figures in the text. These are line drawings which are useful in indicating the method of fabrication of many actual machines and items of plant. It is claimed in the preface that 'the illustrations have all been specially drawn for this book', but in fact many have appeared previously in the book by Badger and McCabe. Nevertheless these drawings are a valuable feature of both books.

The arrangement of the topics discussed is different from that adopted by Badger and McCabe although certain portions are reproduced word for word. Some of the examples are also taken from Badger and McCabe but have been reworked with newer data and many new examples have been included. The problems at the end of each chapter are new, but as appears to be usual in American text books, answers are not provided.

Most of the chapters are not merely revisions of those in Badger and McCabe but have been rewritten and extended. This applies to the chapters on evaporation, distillation, extraction, humidity and air-conditioning, crystallization and filtration.

In the treatment of distillation the Ponchon, enthalpy-composition diagram approach has been used and compared with that based on the use of the McCabe-Thiele diagram. In the gas absorption section, the concept of a transfer unit is discussed as well as the use of mass-transfer coefficients.

'Introduction to Chemical Engineering' is well illustrated and produced and while the praiseworthy features of the earlier book by Badger and McCabe are retained the treatment has been extended and brought up to date. The load on the student beginning a course on unit operations is naturally heavier but presumably this is an inevitable result of any attempt to keep up with the rate of progress in the chemical engineering field.

This new book will be welcomed by teachers of chemical engineering; it will undoubtedly become a standard text-book for many university courses.—R.L.

HOME

Antibiotics Factory Strike

The strike of 450 process workers employed at the Speke, Liverpool, factory of The Distillers Co. (Biochemicals) Ltd. which began on Thursday 12 January, ended on Monday night 16 January. The strike followed a three-day suspension imposed on a labourer in the boilerhouse. The company said that the strike would not seriously delay supplies of pencillin to hospitals, although half of the strikers would be out of work for about a week until production could be fully resumed.

US Atom Scientists Arrive

Fifteen US atom scientists arrived in Britain on Monday 16 January to study UK progress in atomic power production and other branches of nuclear energy. The scientists are led by Mr. Louis H. Roddis, jnr., deputy director of the Division of Reactor Development of the US Atomic Energy Commission.

Queen May Attend Steel Centenary

Sir Robert Chance, Lord-Lieutenant of Cumberland, said on 11 January that when The Queen opened the Calder Hall atomic power station on 17 October it was hoped that she might also visit the works of the Workington Iron & Steel Co. in connection with the centenary of the Bessemer steel-making process.

Chemistry of Radical Reactions

Professor H. W. Melville of the University of Birmingham will give a lecture entitled 'A Study of the Chemistry of Radical Reactions by Radioactive Tracer Techniques' at a Society of Chemical Industry (plastics & polymer group) meeting at the Rooms of the Chemical Society, Burlington House, Piccadilly, London W1, at 6.30 p.m. on 7 February.

New QVF Price List

QVF Limited, of Stone, Staffs, have issued a seven-page price list supplement to their catalogue of 'Quickfit' industrial plant in glass.

Change of Address

Ronsheim & Moore (proprietors: The Gardinol Chemical Co. Ltd.) announce that as from 23 January their address will be 8 Buckingham Palace Gardens, London SW1 (telephone: SLOane 7600).

UK Pharmaceutical Exports

British exports of drugs and medicines in 1955 amounted to £35,900,000, an increase of £3,800,000 over the 1954 figure. The value of the pharmaceutical industry's exports therefore exceeds the cost—about £30,000,000 a year—of drugs supplied by chemists through the National Health Service.

Modified Salk Vaccine

Glaxo Laboratories Ltd., the first company in the UK to produce poliomyelitis vaccine, are producing the new, modified Salk vaccine in conjunction with Burroughs Wellcome. By the spring it is anticipated that vaccines sufficient to inoculate 500,000 children will have been produced. Dr. W. Wood, M.B., B.S., and a team at Glaxo's virus research laboratories have worked for the past six months to achieve this modified vaccine which differs from the original Salk vaccine in that a less virulent strain is used instead of the Mahoney strain. All supplies of the vaccine will go to the Ministry of Health for distribution.

ABPI Forms Veterinary Division

The Council of the Association of British Pharmaceutical Industry has formed a veterinary division. To be known as Division E, it will consist of manufacturers of veterinary pharmaceutical, biological or antibiotic products for the home and export markets.

Fielden Freeze Prices

Fielden (Electronics) Ltd., manufacturers of industrial, laboratory and research electronic instruments, of Manchester, are freezing the home and export prices of all their products for the next six months. When announcing this the company said that if wages and costs were to be stabilized there might be a possibility of effecting a reduction in prices.

Mond Nickel Fellowships

The Mond Nickel Fellowships Committee has invited applications for five fellowships of an approximate value of £900 to £1,200 each for 1956. Fellowships will be awarded to selected candidates of British nationality with degree or equivalent qualifications to enable them to obtain experience and additional training in industrial establishments at home or abroad.

OVERSEAS

Queensland Bans White Lead

The Government of Queensland, Australia, has banned the manufacture, sale and use of paints containing white lead. Under the legislation only paint containing less than five per cent of lead chromate can be manufactured and its use is restricted to the outside of buildings beyond the reach of children. Lead poisoning from paint has been debated on and off for 60 years in Queensland. Surveys taken during this period have revealed that deaths from lead poisoning in Queensland have on occasions been six times higher than the total recorded for the rest of Australia.

New Jamaican Oil Co.

Standard Oil Co. (Indiana) has formed Jamaica Stanolind Oil Co., a new subsidiary of its wholly owned principal subsidiary, Stanolind Oil & Gas Co., to take over licences previously operated by Base Metals, of Canada. Under an agreement with the Jamaican Government, exploratory operations in the island will be started this month.

Syrian Oil Refinery

Syria has invited Britain, the US, France, Russia and Czechoslovakia to submit tenders for the construction of an oil refinery with an annual capacity of 750,000 tons. The Syrian Government when declaring the project for international tender announced that in December Russia had advanced a 'bargain price' tender.

Uranium Negotiations

Lake Nordic Uranium Mines are negotiating with Eldorado Mining & Refining Co. in Montreal for a contract for the sale of uranium concentrates. Production plans are based on an 8,500,000-ton ore-body worth in excess of $100,000,000, with a mill rate of 1,500 tons a day envisaged.

German Potash for Japan

Under a recently signed agreement West Germany will deliver 70,000 metric tons of refined potash to Japan. The value of the delivery will be about DM28,000,000 (£2,400,000).

$18,000,000 Oil Plan

Shell Oil Co. plans to spend over $18,000,000 on exploration and production in West Canada this year, according to Mr. Paul Kartzke, vice-president in charge of the company's western operations.

Safety Data on Naphthalene

The Manufacturing Chemists' Association Inc., of the US, have recently published a 12-page booklet, part of a series of safety data sheets containing essential information for the safe handling and use of naphthalene, including material on shipping containers, storage, waste disposal and health hazards and their control. Copies of the booklet (Sd-58) Naphthalene can be obtained from the Association at 1625 Eye Street Northwest, Washington 6, DC., price 30 cents.

Glaxo's Karachi Factory

Sir Robert Hutchings and Sir Harry Jephcott, directors of Glaxo Laboratories Ltd., attended the recent opening ceremony of Glaxo's new factory in Karachi, Pakistan. Built on a seven-acre site, the factory which occupies 100,000 square feet, will produce antibiotics and a wide range of infant foods. The laboratory is furnished throughout with British equipment.

New Zealand Scheme Dropped

Britain's plans to make heavy water from the hot springs at Wairakei in New Zealand has been abandoned it is reported. Britain and New Zealand were the sole shareholders in the scheme. The original estimate of £2,000,000 is believed to have doubled since 1954. Last month the Prime Minister of New Zealand, Mr. Holland, warned that the project might be dropped because of increases in the estimated cost.

Natural Gas Reserve

A major natural gas reserve appears to have been discovered in the Beaverhill Lake area 40 miles east of Edmonton, Canada, it is reported by Northwestern Utilities Ltd. The company has completed drilling of its second well in the area, resulting in an estimated open flow of more than 42,000,000 cubic feet per day. The first well drilled by the company in this area earlier in 1955 had an open flow of 12,000,000 cubic feet per day.

Indian Fertilizers

Sindri Fertilisers & Chemicals Ltd., India's premier State-owned undertaking, made gross profits amounting to nearly Rs.39,600,000 in 1954-55, which is about 12,500,000 higher than the previous year's figure.

· PERSONAL ·

MR. R. ROSSON, formerly with the Geigy Pharmaceutical Co. Ltd., has been appointed commercial manager of Croda Ltd.'s associate company in Italy, Croda Italiana SrL. Mr. Rosson who comes from Salford, Manchester, leaves to take up his appointment this month.

DR. CECIL L. WILSON, PH.D., D.SC., F.R.I.C., reader in analytical chemistry, Queen's University, Belfast, has been invited as the European guest speaker to the Symposium on Analytical Chemistry to be held from 30 January to 2 February at Louisiana State University, where he will deliver four lectures. During his two weeks' stay in the US, Dr. Wilson will also lecture on analytical topics at Texas University and Florida State University. In addition, he will give a lecture sponsored by the Faculties of Chemistry and Law, Texas University, on some aspects of the scientific examination of documents.

The British Aluminium Co. announces that MR. S. F. DERBYSHIRE will relinquish his position as general production manager on reaching the retirement age on 17 February. He will afterwards remain in a consultative capacity. MR. W. B. C. PERRYCOSTE and MR. J. SALTER will become joint general production managers as from 17 February. Other appointments announced are MR. P. T. ENSOR to be general manager of the Canadian British Aluminium Co. at Baie Comeau with effect from 1 January, and MR. A. R. WYLIE works designate for the Canadian British Aluminium Co. project at Baie Comeau.

MAJOR CHARLES FLANDERS is leaving the Lime Division of Imperial Chemical Industries on 31 March to take up appointments with Holme Park Lime, Knowle Lime, Ridge Limestone, and Withers Limestone.

DR. BRUCE H. BILLINGS, director of research at Baird Associates Inc., Cambridge, Massachusetts, has been named general manager, it was announced by DR. WALTER S. BAIRD, the president. Dr. Billings, who was elected to the company's board of directors at the recent annual meeting, will continue to direct all technical programmes at the firm's main plant in Cambridge and at the Baird transistorized products activity in Waltham, Mass. He joined Baird Associates Inc. in 1947. A graduate of Harvard, Dr. Billings received his Ph.D. degree in physics from Johns Hopkins University in 1941.

It is announced that MR. F. J. BOGGIANO, until recently sales manager of The Propane Co. Ltd., has joined R. H. Cole & Co. Ltd.'s general chemicals division.

Obituary

The death is announced of MR. ROBERT RICHARDSON, aged 50, of Euxton, Wigan. A prominent figure in the dyeing industry in the North of England, Mr. Richardson was a branch director of the Standish Co., of Wigan, a subsidiary of the Bradford Dyers' Association, of which he was also a director.

MR. HARRY DEAN, the manager of the Manchester branch office of J. W. Towers & Co. Ltd., laboratory furnishers, scientific apparatus and pure chemical manufacturers, of Widnes, Lancs, died suddenly on 19 January, aged 60. Mr. Dean joined the company in 1939.

PROFESSOR A. O. RANKINE, O.B.E., D.SC., F.R.S., Emeritus Professor of Physics at the Imperial College of Science and Technology, London, died in a London nursing home on Thursday 19 January, aged 74. Educated at Guildford Grammar School and the University of London, Professor Rankine was concerned with the development of the theory of gases which first took account of the fact that gases consisted of individual molecules whose properties could, on average, be calculated by statistical means. In 1927 he became interested in geophysics, especially in relation to their search for oil, and became adviser on such matters to the Anglo-Persian (now Anglo-Iranian) Oil Co. In 1937 he was appointed chief physicist of the company, a position he gave up to join Imperial College. During the last war Professor Rankine was concerned with the development of the airfield fog dispersal system known as 'Fido'.

Canadian Chemicals

Increase for 10th Consecutive Year

MR. H. Greville Smith, president of Canadian Industries Ltd., said in a review that for the 10th consecutive year the value of Canadian chemicals and allied products rose during 1955, and reached an estimated total of $1,030,000,000. The entire advance of more than $100,000,000 over the 1954 total represented higher physical volume, as prices of chemicals changed only slightly during the year. Exports accounted for nearly half the total increase in chemicals output last year, rising by a third over the 1954 level and narrowing the gap in dollars between chemical imports and exports to the lowest amount in recent years.

Upward Movement

Within Canada, the demand for the industry's products benefited from the resumption of the upward movement in economic activity which had been briefly interrupted during the early months of 1954. Such important consumers of basic chemicals as the mining and forest product industries, in which the upward tendency originated, responded early in 1955 to the vigorous foreign demand for industrial raw materials. By the second quarter the improvement had spread to the domestic manufacturing and construction industries, which with few exceptions operated at near-capacity rates during the remainder of 1955. There is as yet no evidence that industrial activity will slacken during at least the early months of 1956, despite the continued weakness of markets for agricultural products. Present indications are such that the chemical industry can expect the new year to bring further increase in sales and employment.

The need to keep pace with expanding markets, and the industry's confidence in the future, resulted in a sharp increase in new capital investment last year to an estimated $70,000,000, compared, with $40,000,000 for 1954. Capital expenditures in the chemical industry during 1956 are expected considerably to exceed the total for 1955.

For example, coastal British Columbia for the first time is emerging as an important chemical producing region with the announcement of plants to supply the pulp and paper industry with sodium chlorate, chlorine and caustic soda. Additional sulphuric acid capacity has been installed or is to be built in Alberta, northern Ontario and Quebec to serve the needs of uranium and base metal ore processors and of heavy manufacturing industries. In response to the expanding markets provided by agriculture, metallurgy and the wood pulp industry, and in some cases spurred by the increasing availability of natural gas, additional ammonia capacity is proposed or under way at various locations in Canada.

In Ontario the capacity of the sole Canadian soda ash plant will be equal to the estimated domestic market for this chemical when the current expansion programme is completed early in 1957. Plants for the manufacture of explosives and synthetic fibre have also been announced for 1956.

An interesting development evident in recent years, and continued during 1955, has been the tendency for firms in industries other than chemicals and allied products to undertake the production of chemicals used in or derived from their own processes. An oil exploration company, for example, will shortly produce important amounts of sulphur from natural gas at Pincher Creek, Alberta.

Petrochemicals

Oil refining companies are becoming increasingly interested in petrochemicals, and a pulp and paper manufacturer in British Columbia plans to produce chemicals derived from wood. One of the principal rubber companies will shortly produce vinyl chloride for plastics.

Plans announced during 1955 included some ventures into manufacturing chemicals not hitherto produced in Canada, such as a titanium dioxide white pigment plant at Varennes, Quebec; a tetraethyl lead installation at Sarnia, Ontario; and facilities at Valleyfield, Quebec, to produce catalysts for petroleum cracking.

Consolidated Engineering Products Ltd., of London, are now the exclusive agents in the UK of Tissot & Co., of Paris, manufacturers of all types of storage tanks for the petroleum and chemical industries.

British Chemical Prices

(These prices are checked with the manufacturers, but it must be pointed out that in many cases there are variations according to quantity, quality, place of delivery, etc.)

LONDON.—Steady trading conditions with prices generally firm describe most sections of the industrial chemicals market during the past week. Deliveries to the home consuming industries against contracts have covered good quantities and a fair amount of new business has been placed for fertilizers. Fluctuations in the non-ferrous metal prices have influenced quotations for the chemical compounds. From 24 January prices for lead compounds are as follows: genuine red lead £148 per ton, orange lead £160 per ton, ground in oil red lead £165 10s, ground in oil orange lead £177 10s, white lead £152 5s, ground in oil white lead 194s per cwt. and litharge £150. A brisk demand has been experienced for most of the coal tar products with spot offers finding a ready outlet. There has been a noticeable improvement in the demand for cresylic acid.

MANCHESTER.—Steady to firm price conditions are the rule on the Manchester market for chemical products and little change of any consequence has occurred since the last report. Contract requirements from the textile and allied trade and from other leading industrial outlets are on a satisfactory scale and fresh enquiry and actual new business during the past week has been fair in the aggregate. In some sections of the fertilizer trade current business is on steady lines and in others some improvement has occurred. The tar products generally are moving steadily into consumption.

GLASGOW.—Demand generally in the Scottish market has been very brisk during the past week, and a good volume of business has been concluded, covering most sections of the industry. Contract deliveries have been well maintained. Although the majority of prices have remained unchanged, some increases have to be reported. Quite a range of export enquiries are being received and trade continues at a good level.

General Chemicals

Acetic Acid.—Per ton: 80% technical, 10 tons, £83; 80% pure, 10 tons, £89; commercial glacial, 10 tons, £91; delivered buyers' premises in returnable barrels (technical acid barrels free); in glass carboys, £7; demijohns, £11 extra.

Acetic Anhydride.—Ton lots d/d, £123 per ton.

Alum.—Ground, about £25 per ton, f.o.r. MANCHESTER: Ground, £25.

Aluminium Sulphate.—Ex works, £14 15s per ton d/d. MANCHESTER: £14 10s to £17 15s.

Ammonia, Anhydrous.—1s 9d to 2s 3d per lb.

Ammonium Bicarbonate.—2-cwt. non-returnable drums, 1-cwt. non-returnable kegs; 1-ton lots, £50 5s per ton.

Ammonium Chloride.—Per ton lot, in non-returnable packaging, £27 17s 6d.

Ammonium Nitrate.—D/d, £31 per ton (in 4-ton lots).

Ammonium Persulphate. — MANCHESTER: £6 2s 6d per cwt., in 1-cwt. lots, delivered. £112 10s per ton, in minimum 1-ton lots, delivered.

Ammonium Phosphate.—Mono- and di-, ton lots, d/d, £97 and £94 10s per ton.

Antimony Sulphide.—Crimson, 4s 4d to 4s 9½d; golden, 2s 7½d to 4s 0¾d; all per lb., delivered UK in minimum 1-ton lots.

Arsenic.—Per ton, £45 to £50 ex store.

Barium Carbonate.—Precip., d/d; 4-ton lots, £41 per ton; 2-ton lots, £41 10s per ton, bag packing.

Barium Chloride.—£42 15s per ton in 2-ton lots.

Barium Sulphate (Dry Blanc Fixe).—Precip., 4-ton lots, £42 10s per ton d/d; 2-ton lots, £43 per ton d/d.

Bleaching Powder.—£28 12 6d per ton in returnable casks, carriage paid station, in 4-ton lots.

Borax.—Per ton for ton lots, in hessian sacks, carriage paid: Technical, anhydrous, £61 10s; granular, £41; crystal, £43 10s; powder, £44 10s; extra fine powder, £45 10s; BP, granular, £50; crystal, £52 10s; powder, £53 10s; extra fine powder, £54 10s.

Boric Acid.—Per ton for ton lots, in hessian sacks, carriage paid : Technical, granular, £70 ; crystal, £78 ; powder, £75 10s ; extra fine powder, £77 10s ; BP granular, £83 ; crystal, £90 ; powder, £87 10s ; extra fine powder, £89 10s.

Calcium Chloride.—Per ton lots, in non-returnable packaging : solid, £15 ; flake, £16.

Chlorine, Liquid.—£37 10s per ton, in returnable 16-17-cwt. drums, delivered address in 3-drum lots.

Chromic Acid.—2s 0⅜d per lb., less 2½%, d/d UK, in 1-ton lots.

Chromium Sulphate, Basic.—Crystals, 7⅞d per lb. delivered (£73 10s per ton).

Citric Acid.—1-cwt. lots, £10 5s cwt.

Cobalt Oxide.—Black, delivered, bulk quantities, 13s 2d per lb.

Copper Carbonate.—3s per lb.

Copper Sulphate.—£116 15s per ton f.o.b., less 2% in 2-cwt. bags.

Cream of Tartar.—100%, per cwt., about £11 12s.

Formaldehyde.—£37 5s per ton in casks, d/d.

Formic Acid.—85%, £86 10s in 4-ton lots' carriage paid.

Glycerine.—Chemically pure, double distilled 1.260 S.G., £12 9s 0d per cwt. Refined pale straw industrial, 5s per cwt. less than chemically pure.

Hydrochloric Acid.—Spot, about 12s per carboy d/d, according to purity, strength and locality.

Hydrofluoric Acid.—59/60%, about 1s 3d per lb.

Hydrogen Peroxide.—27.5% wt., £128 10s per ton. 35% wt., £158 per ton d/d. Carboys extra and returnable.

Iodine.—Resublimed B.P., 17s 7d per lb., in 28-lb. lots.

Iodoform.—£1 6s 7d per lb., in 28-lb. lots.

Lactic Acid.—Pale tech., 44 per cent by weight, 14d per lb. ; dark tech., 44 per cent by weight, 8½d per lb., ex-works ; chemical quality, 44 per cent by weight, 1s 2½d per lb., ex-works ; 1-ton lots, usual container terms.

Lead Acetate.—White : About £150 per ton.

Lead Nitrate.—About £135 1-ton lots.

Lead, Red.—Basis prices per ton. Genuine dry red, £148 ; orange lead, £160. Ground in oil : red, £165 10s ; orange, £177 10s.

Lead, White.—Basis prices : Dry English in 5-cwt. casks £152 5s per ton. Ground in oil : English, 1-cwt. lots 194s per cwt.

Lime Acetate.—Brown, ton lots, d/d, £40 per ton ; grey, 80-82%, ton lots, d/d, £45 per ton.

Litharge.—£150 per ton, in 5-ton lots.

Magnesite.—Calcined, in bags, ex-works, about £21 per ton.

Magnesium Carbonate.—Light, commercial, d/d, 2-ton lots, £84 10s per ton, under 2 tons, £92 per ton.

Magnesium Chloride.—Solid (ex-wharf), £16 per ton.

Magnesium Oxide.—Light, commercial, d/d, under 1-ton lots, £245 per ton.

Magnesium Sulphate.—Crystals, £16 per ton.

Mercuric Chloride.—Technical Powder, £1 5s per lb., in 5-cwt. lots ; smaller quantities dearer.

Mercury Sulphide, Red.—£1 9s 3d per lb., for 5-cwt. lots.

Nickel Sulphate.—D/d, buyers UK £170 per ton. Nominal.

Nitric Acid.—80° Tw., £35 per ton.

Oxalic Acid.—Home manufacture, minimum 4-ton lots, in 5-cwt. casks, about £130 per ton, carriage paid.

Phosphoric Acid.—Technical (S.G. 1.700) ton lots, carriage paid, £92 per ton ; B.P. (S.G. 1.750), ton lots, carriage paid, 1s 3½d per lb.

Potash, Caustic.—Solid, £93 10s per ton for 1-ton lots ; Liquid, £36 5s.

Potassium Carbonate.—Calcined, 96/98%, about £74 10s per ton for 1-ton lots, ex-store.

Potassium Chloride.—Industrial, 96%, 1-ton lots, about £24 per ton.

Potassium Dichromate.—Crystals and granular, 1s 1d per lb., in 5-cwt. to 1-ton lots, d/d UK.

Potassium Iodide.—B.P., 14s 1d per lb. in 28-lb. lots ; 13s 7d in cwt. lots.

Potassium Nitrate.—In 4-ton lots, in non-returnable packaging, paid address, £63 10s per ton.

Potassium Permanganate.—BP, 1-cwt. lots, 1s 9d per lb. ; 3-cwt. lots, 1s 8½d per lb. ; 5-cwt. lots, 1s 8d per lb. ; 1-ton lots, 1s 7¾d per lb. ; 5-ton lots, 1s 7¼d per lb. ; Tech., 5-cwt. packed in 1-cwt. drums, £8 14s 6d per cwt. ; packed in 1 drum, £8 9s. 6d per cwt.

Salammoniac.—Per ton lot, in non-returnable packaging, £45 10s.

Salicylic Acid.—MANCHESTER : Technical 2s 7½d per lb. d/d.

Soda Ash.—58% ex-depot or d/d, London station, about £15 5s 6d per ton, 1-ton lots.

Soda, Caustic.—Solid 76/77% ; spot, £30 to £32 per ton d/d (4 ton lots).

Sodium Acetate.—Commercial crystals, £91 per ton d/d.

Sodium Bicarbonate.—Per ton lot, in non-returnable packaging, £15 10s.

Sodium Bisulphite. — Powder, 60/62%, £42 15s d/d in 2-ton lots for home trade.

Sodium Carbonate Monohydrate.—Per ton lot, in non-returnable packaging, paid address, £59 5s.

Sodium Chlorate.—About £80 per ton in 1-cwt. drums, carriage paid station, in 4-ton lots.

Sodium Cyanide.—96/98%, £113 5s per ton lot in 1-cwt. drums.

Sodium Dichromate.—Crystals, cake and powder, 10¾d per lb. Net d/d UK, anhydrous, 1s 0½d per lb. Net del. d/d UK, 5-cwt. to 1-ton lots.

Sodium Fluoride.—Delivered, 1-ton lots and over, £5 per cwt. ; 1-cwt. lots, £5 10s per cwt.

Sodium Hyposulphite.—Pea crystals £35 15s a ton ; commercial, 1-ton lots, £32 10s per ton, carriage paid.

Sodium Iodide.—BP, 17s 1d per lb. in 28-lb. lots.

Sodium Metaphosphate (Calgon).—Flaked, loose in metal drums, £133 per ton.

Sodium Metasilicate.—£25 per ton, d/d UK in ton lots, loaned bags.

Sodium Nitrate.—Chilean refined granulated over 98% 6-ton lots, d/d station, £28 10s.

Sodium Nitrite.—£32 per ton (4-ton lots).

Sodium Percarbonate.—12½% available oxygen, £8 6s 9d per cwt. in 1-cwt. kegs.

Sodium Phosphate.—Per ton d/d for ton lots : Di-sodium, crystalline, £38 10s, anhydrous, £84 ; tri-sodium, crystalline, £39 10s, anhydrous, £82.

Sodium Silicate.—75-84° Tw. Lancashire and Cheshire, 4-ton lots, d/d station in loaned drums, £10 15s per ton ; Dorset, Somerset and Devon, £3 17s 6d per ton extra ; Scotland and S. Wales, £3 per ton extra. Elsewhere in England, excluding Cornwall, and Wales, £1 12s 6d per ton extra.

Sodium Sulphate (Desiccated Glauber's Salts).—d/d in bags ton, £18.

Sodium Sulphate (Glauber's Salt).—About £9 5s to £10 5s per ton d/d.

Sodium Sulphate (Salt Cake).—Unground. £6 per ton d/d station in bulk. MANCHESTER : £6 10s per ton d/d station.

Sodium Sulphide.—Solid, 60/62%, spot, £33 2s 6d per ton, d/d, in drums in 1-ton lots ; broken, £34 2s 6d per ton, d/d, in drums in 1-ton lots.

Sodium Sulphite.—Anhydrous, £66 5s per ton ; commercial, £25 5s to £27 per ton d/d station in bags.

Sulphur.—Per ton for 4 tons or more, ground, £20 to £22, according to fineness.

Sulphuric Acid.—Net, naked at works, 168° Tw. according to quality, per ton, £10 7s 6d to £12 ; 140° Tw., arsenic free, per ton, £8 12s 6d ; 140° Tw., arsenious, per ton, £8 4s 6d.

Tartaric Acid.—Per cwt. : 10 cwt. or more £13 15s.

Titanium Oxide.—Standard grade comm., with rutile structure, £162 per ton ; standard grade comm., £142 per ton.

Zinc Oxide.—Maximum price per ton for 2-ton lots, d/d, white seal, £119 ; green seal, £117 ; red seal, 2-ton lots, £114 per ton.

Solvents & Plasticizers

Acetone.—Small lots : In 5-gal. cans : 5-gal., £125, 10-gal. and upward, £115, cans included. In 40/45 gal. returnable drums, spot : Less than 1 ton, £90 ; 1 to less than 5 tons, £87 ; 5 to less than 10 tons, £86 ; 10 tons and upward, £85. In tank wagons, spot : 1 to less than 5 tons (min. 400 gal.), £85 ; 5 to less than 10 tons (1,500 gal.), £84 ; 10 tons and upward (2,500 gal.), £83 ; contract rebate, £2. All per ton d/d.

Butyl Acetate BSS.—£159 per ton, in 10-ton lots.

***n*-Butyl alcohol, BSS.**—10 tons, in drums, £143 per ton d/d.

***sec*-Butyl Alcohol.**—5 gal. drums £159 ; 40 gal. drums : less than 1 ton £124 per ton ; 1 to 10 tons £123 per ton ; 10 tons and over £119 per ton ; 100 tons and over £120 per ton.

***tert*-Butyl Alcohol.**—5-gal. drums £195 10s. per ton ; 40/45 gal. drums : less than 1 ton £175 10s per ton ; 1 to 5 tons £174 10s per ton ; 5 to 10 tons, £173 10s ; 10 tons and over £172 10s.

Diacetone Alcohol.—Small lots : 5 gal. drums, £177 per ton ; 10 gal. drums, £167 per ton. In 40/45 gal. drums ; less than 1 ton, £142 per ton ; 1 to 9 tons, £141 per ton ; 10 to 50 tons, £140 per ton ; 50 to 100 tons, £139 per ton ; 100 tons and over, £138 per ton.

Dibutyl Phthalate.—In drums, 10 tons, 2s per lb. d/d ; 45-gal. drums, 2s 1½d per lb. d/d.

Diethyl Phthalate.—In drums, 10 tons, 1s 11½d per lb. d/d ; 45 gal. drums, 2s 1d per lb. d/d.

Dimethyl Phthalate.—In drums, 10 tons, 1s 9d per lb. d/d ; 45 gal. drums, 1s 10½d per lb. d/d.

Dioctyl Phthalate.—In drums, 10 tons, 2s 8d per lb. d/d ; 45 gal. drums, 2s 9½d per lb. d/d.

Ether BSS.—In 1 ton lots, 1s 11d per lb. ; drums extra.

Ethyl Acetate.—10 tons lots, d/d, £128 per ton.

Ethyl Alcohol (PBS 66 o.p.).—Over 300,000 p. gal., 2s 9d ; 2,500-10,000 p. gal., 2s 11½d per p. gal., d/d in tankers. D/D in 40/45-gal. drums, 1d p.p.g. extra. Absolute alcohol (75.2 o.p.) 5d p.p.g. extra.

Methanol.—Pure synthetic, d/d, £43 15s per ton.

Methylated Spirit.—Industrial 66° o.p. : 500 gal. and over in tankers, 4s 10d per gal. d/d ; 100-499 gal. in drums, 5s 2½d per gal. d/d. Pyridinised 64 o.p. : 500 gal. and over in tankers, 5s 0d per gal. d/d ; 100-499 gal. in drums, 5s 4½d per gal. d/d.

Methyl Ethyl Ketone.—10-ton lots, £133 per ton d/d ; 100-ton lots, £131 per ton d/d.

Methyl *iso*Butyl Ketone.—10 tons and over £159 per ton.

***iso*Propyl Acetate.**—In drums, 10 tons, £123 per ton d/d ; 45 gal. drums, £129 per ton d/d.

***iso*Propyl Alcohol.**—Small lots: 5-gal. drums, £118 per ton ; 10-gal. drums, £108 per ton ; in 40-45 gal. drums ; less than 1 ton, £83 per ton ; 1 to 9 tons £81 per ton ; 10 to 50 tons, £80 10s per ton ; 50 tons and over, £80 per ton.

Rubber Chemicals

Carbon Bisulphide.—£61 to £67 per ton, according to quality.

Carbon Black.—8d to 1s per lb., according to packing.

Carbon Tetrachloride.—Ton lots, £79 10s per ton.

India-Rubber Substitutes.—White, 1s 5¾d to 1s 9½d per lb. ; dark, 1s 4d to 1s 6¾d per lb. delivered free to customers' works.

Lithopone.—30%, about £55 per ton.

Mineral Black.—£7 10s to £10 per ton.

Sulphur Chloride.—British, about £50 per ton.

Vegetable Lamp Black.—£64 8s per ton in 2-ton lots.

Vermilion.—Pale or deep, 15s 6d per lb. for 7-lb. lots.

Coal-Tar Products

Benzole.—Per gal., minimum of 200 gals. delivered in bulk, 90's. 5s ; pure, 5s 4d.

Carbolic Acid.—Crystals, minimum price 1s 4d to 1s 7d per lb. delivered in bulk, ½d per lb. extra in 40/50 gal. returnable drums. Crude, 60's, 8s per gal. Crystals, 1s 4d to 1s 7d per lb., d/d crude, 8s naked, at works.

Creosote.—Home trade, 1s to 1s. 9d per gal. according to quality, f.o.r. maker's works. MANCHESTER : 1s to 1s 8d per gal.

Cresylic Acid.—Pale 99/100%, 6s 4d per gal. ; 99.5/100%, 6s 6d per gal. D/d UK in bulk : Pale A.D.F. from 6s 5d per imperial gallon f.o.b. UK, 85 cents per US gallon, c.i.f. NY.

Naphtha.—Solvent, 90/160°, 5s per gal ; heavy, 90/190°, 3s 11d per gal. for bulk 1000-gal. lots, d/d. Drums extra ; higher prices for smaller lots.

Naphthalene.—Crude, 4-ton lots, in buyers' bags, £17 14s to £29 2s per ton nominal, according to m.p. ; hot pressed, £40 18s per ton in bulk ex-works ; refined crystals, £59 10s per ton d/d min. 4-ton lots.

Pitch.—Medium, soft, home trade, £9 per ton f.o.r. suppliers' works ; export trade about £10 10s per ton f.o.b. suppliers' port.

Pyridine.—90/160, 20/- to £1 2s 6d per gal.

Toluole.—Pure, 5s 9d ; 90's 5s 0d per gal. d/d. MANCHESTER : Pure, 5s 7d per gal. naked.

Xylole.—For 1000-gal. lots, 5s 10d to 6s per gal., according to grade, d/d London area in bulk.

Intermediates & Dyes (Prices Nominal)

***m*-Cresol** 98/100%.—4s 9d per lb. d/d.

***o*-Cresol** 30/31° C.—1s per lb. d/d.

***p*-Cresol** 34/35° C.—4s 9d per lb. d/d.

Dichloraniline.—4s 3½d per lb.

Dinitrobenzene.—88/99° C., 2s per lb.

Dinitrotoluene.—S.P. 15° C., 2s 0½d per lb. ; S.P. 26° C., 1s 4d per lb. ; S.P. 33° C., 1s 2d per lb. ; S.P. 66/68° C., 1s 10d per lb. Drums extra.

***p*-Nitraniline.**—4s 10d per lb.

Nitrobenzene.—Spot, 10d per lb. in 90-gal. drums, drums extra, 1-ton lots d/d buyers' works.

Nitronaphthalene.—2s 4d per lb.

***o*-Toluidine.**—1s 10d per lb., in 8/10-cwt. drums, drums extra.

***p*-Toluidine.**—5s 9½d per lb., in casks.

Dimethylaniline.—3s 3d per lb., drums extra, carriage paid.

Chemical & Allied Stocks & Shares

A SHORT-lived rally in stock markets at the beginning of this month quickly gave way to a reaction and caution by buyers in nearly all sections. This reflected uncertainty as to what the new measures are that are planned by the Government to deal with inflation, and when they will be put into force. The big talking point is that they may not be announced until the April Budget, in which case it would mean a period of doubts and fears for industry.

It seems that uncertainty must prevail in stock markets until the position is clarified. The fall in British Funds reflects fears that the bank rate may be raised again, though this is apparently now less widely expected. The Prime Minister has called for increased profits to be used to reduce prices of goods and not for increasing dividends. But it is realized that, taking more than a very short view, the key to the position is whether Government expenditure will be cut to an extent that permits some reduction in taxation, and whether the coal and other nationalized industries keep prices down.

Dividends Maintained

Imperial Chemical Industries has invariably followed a policy of low prices, relying on expansion in turnover to increase profits. The prevailing assumption is that there seem reasonable prospects of dividends of leading chemical companies being maintained, and on this basis yields generally are not unattractive. It seems probable, therefore, that chemical shares will rally when there is a recovery in stock markets.

Compared with a month ago, Imperial Chemical were 1s 10½d down at 45s 10½d. Fisons came back from 56s to 54s 3d and Brotherton 10s shares from 36s 3d to 34s 6d. Monsanto 5s shares at 27s 6d were the same as a month ago.

Hardman & Holden 5s shares receded from 13s 3d to 12s 3d, but Hickson & Welch 10s shares displayed activity in anticipation of the financial results, and were 31s, a rise of 1s on the month. Albright & Wilson 5s shares were a relatively steady feature on the belief that the acquisition of Marchon Products opens up considerable scope for expansion in the future, and at 20s 3d were within a few pence of the price ruling a month ago. Anchor Chemical 5s shares held steady at 14s 6d as did Yorkshire Dyewares & Chemical shares at 10s 9d.

Reichhold 5s shares remained an active feature, and though not holding best prices, were 6d higher on the month at 20s 6d. Lawes Chemical 10s shares strengthened to 16s 6d. Laporte 5s shares, however, came back from 17s 10½d to 16s 6d. In other directions, British Chrome Chemicals 5s shares eased from 13s 9d to 13s and British Glues & Chemicals 4s shares eased slightly to 16s 3d, the proposed free scrip issue being below some market expectations. F. W. Berk 5s shares were 8s 9d, a few pence higher on balance. Coalite & Chemical 2s shares eased from 4s a month ago to 3s 9d. Among plastics, British Industrial 2s shares came back from 6s 7½d to 5s 9d xd, and British Xylonite were 40s 3d compared with 42s 6d.

Borax Consolidated

Borax Consolidated deferred units were, as usual, a very active feature, and after another sharp advance came back with the general trend of markets, but nevertheless were 167s 6d, compared with 157s 6d a month ago. The assumption in the market is that there is an increased distribution of some kind in prospect for shareholders, possibly in the form of a free scrip issue. That is why the shares are valued on a basis showing a yield of little more than two per cent on the basis of last year's dividend.

Elsewhere, Triplex Glass 10s shares were 32s 10½d compared with 44s a month ago. William Blythe 3s shares remained active, but at 14s were 1s down on the price current a month ago. There have been some sharp falls in oils. BP, for instance, were 100s compared with 106s 3d a month ago, while Shell have come back from 141s 3d to 131s 3d.

Census of Production

The Board of Trade has just published 'The Report on the Census of Production for 1951, Vol. 2, Trade E, Chemicals (General)', price 2s. This report relates to establishments engaged mainly or wholly in the manufacture of acids, alkalis, salts, industrial gases and miscellaneous chemicals. Copies are obtainable from HMSO.

Publications & Announcements

PROTECTION of steelwork against corrosion is said to be possible using Denso tape manufactured by Winn & Coales Ltd., Denso House, Chapel Road, London SE27. Denso tape is claimed to give a completely air and water proof seal, thus providing protection against all corrosive influences. It is unalterable in composition and plasticity over a wide range of temperatures and is claimed to be highly resistant to acids, alkalis and salts. Condensation is also eliminated or very much reduced, and such condensation as does occur is said to be free from iron oxide staining properties. The method of application is first to clean the surface by removing all loose scale and then to rub or brush Denso paste over the entire surface. Widths of tape are chosen which enable all overlaps to be made on the top of horizontal surfaces or in a downward direction on vertical surfaces. Winn & Coales also manufacture a variety of other products for the protection of pipework, electrical equipment, gas holders and similar containers, bi-metallic junctions, all types of joints and for caulking, sealing and glazing.

* * *

A REPORT on Danish literature dealing with pure and applied chemistry has been prepared by the Danish National Council of Chemistry and the Danish Technical Information Service. The report includes periodicals, manuals, books and pamphlets and is divided into five sections, each of which lists the above mentioned literature chronologically: A_1—literature on a university level written in or with summaries in a foreign language, A_2—literature on a university level written in Danish only, B—literature on the level of secondary schools or technical schools below the university level, C—literature on the primary school level, D—literature on a very popular level. Copies of the report are available from the Danish Technical Information Service (Dansk Teknisk Oplysningstjeneste), Oster Volgade 10, Copenhagen, K. Denmark at a price of Danish Kr. 15.00, including postage.

* * *

DIAGRAMS and details of the Wilton pipe-still for continuous tar distillation have been published in a booklet recently issued by Chemical Engineering Wiltons Ltd., of Cheadle Heath, Stockport, Lancashire, a subsidiary of Simon-Carves Ltd. Developed to meet modern needs, the Wilton pipe-still gives a high capacity in single units, efficient fuel utilization, easy accessibility of pipes, and easy replacement of tubes. The salient features of the Wilton principle of tar distillation are that an approximately constant volume of hot pitch is continuously pumped in a closed circuit and crude tar (usually pre-heated) is fed into the distillation column where it comes into liquid/liquid contact with the hot pitch so that tar at approximately 120°C is brought into contact with four or five times its volume of pitch at 350°C. The result is that the volatile oils are distilled off so that the pitch is thereby cooled to 280 to 290°C and pumped through the pipe-still to be reheated to 350°C. Pitch constituents of the tar remain in the pitch circulating through the pipe-still, while an equivalent quantity of pitch is withdrawn from the distillation column as product. During the process the crude tar does not come into contact with the pipe-still tubes and is not directly subjected to thermal cracking. Products of dissociation of ammonium chloride etc. which are apt to be corrosive, neither come into contact with the pipe-still tubes. The first of these new Wilton pipe-still units recently went into operation at the Caerphilly tar works of the NCB. Other units are under construction at the Avenue coke-oven site near Chesterfield and for Dorman Long (Chemicals) Ltd., at Port Clarence, and for the Lancashire Tar Distillers and the NCB East Midlands division.

* * *

A COMPREHENSIVE manual of filtration especially written for product designers is available from Purolator Products Inc., Rahway, New Jersey, US (postage 25 cents). The manual describes numerous filter applications and deals with such design considerations as flow rates viscosities of fluids, and contamination to be removed, as well as filter costs, space requirements of the designer, types of filter elements and the proper selection of elements. A complete glossary of filtration terms is also included as well as numerous illustrations and charts.

Law & Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages & Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary but such total may have been reduced.)

AEROSOL PRODUCTS LTD. London, W. sterilization apparatus &c.—19 December, mortgage to Westminster Bank Ltd. securing all moneys due or to become due to the Bank; charged on certain contract moneys. *Nil. 31 December, 1953.

STEWART CHEMICALS LTD. London, E.C.—21 December, £1,550 mortgage to Hon. H.L.F. Moulton, London, & ors.; charged on 37 Rothschild-rd. Acton. *Nil. 5 November, 1955.

Satisfactions

KIMBERLEY-BINGHAM & CO. LTD. Kidderminster, textile engineers.—Satisfaction 3 January, of debenture registered 16 June, 1952.

SOLO LABORATORIES LTD. London, E.C. chemical manufacturers &c.—Satisfaction 30 December, of charge registered 12 June, 1952.

Changes of Name

ATKINSON & ERASMIC LTD. Unilever House, Blackfriars, London EC4, changed to J. & E. Atkinson (Services) Ltd. on 19 December 1955.

IRVING'S YEAST-VITE LTD., 68 Pall Mall, London SW1, changed to Harold F. Ritchie Ltd., on 13 December.

Increases of Capital

PARFUMERIE DELAFINE LTD. 18 Chenies Street, London WC1, increased by £8,300, in 1s shares, beyond the registered capital of £11,600.

BAYER PRODUCTS LTD. Africa House, Kingsway, London WC2, increased by £270,000, in £1 ordinary shares, beyond the registered capital of £80,000.

SOUTHON LABORATORIES LTD., manufacturing chemists etc., 88 Upper Richmond Road, London SW15, increased by £10,000, in £1 deferred ordinary shares, beyond the registered capital of £25,000.

OPTREX LTD., Wadsworth Road, Perivale, Greenford, Middlesex, increased by £50,000, in £1 ordinary shares, beyond the registered capital of £100,000.

New Registrations

Aerosols Ltd.

Private company (15,820.) Registered in Dublin. Capital £10,000 in £1 shares (4,000 'A' ordinary and 6,000 'B' ordinary). The carry on the business of manufacturers, importers, dealers and distributors of pharmaceutical, medicinal and chemical goods of all kinds etc. Directors: Reginald Knight, 11 St. Albans Park, Ballsbridge, Dublin, Godfrey M. Goodbody, 4 Appian Way, Dublin, and Richard B. Dawson.

Beverly Smyth & Sons Ltd.

Private company (15,827.) Registered in Dublin. Capital £10,000 in £1 shares (4,000 'A' ordinary and 6,000 'B' ordinary). Objects and other particulars similar to Aerosols Ltd. (q.v.).

Numismators Ltd.

Private company (559,396.) Capital £1,000 in £1 shares. To carry on the business of electrical, electronic and nucleonic research and precision engineers, consultants and developers; automobile and general engineers; as industrial analytical research and consulting chemists, distillers and metallurgists etc. Directors: Reuben Josephs, 19 Manor Drive, Benton, Newcastle-on-Tyne, Thomas R. Burton, 49 Simonburn Avenue, Fenham, Newcastle-on-Tyne, David Josephs, Benjamin Leon and Samuel H. Mincoff. Reg. office: 105 Clayton Street, Newcastle-on-Tyne.

L. Lion Ltd.

Private company (559,377.) Capital £100 in £1 shares. To carry on the business of metal and chemical merchants etc. Subscribers (each with one share): H. Sidney Garfield and William M. Pybus of 20 Copthall Avenue, London EC2.

Waxes Ltd.

Private company (559,805.) Capital £2,000 in £1 shares (66 'A' and 1,934 'B'). To

carry on the business of general merchants; in particular to buy, sell import, export and deal in oils, waxes, chemicals, drugs, medicines, pharmaceutical supplies, materials and products, dyestuffs, paints etc. Directors: Anthony J. Green, 26 Fairway, Grays, Essex, and Clifford Boughton, 33 Cuckoo Hill Road, Pinner, Middlesex. Reg. office: 17 Albemarle Street, London W1.

Tri Chem Ltd.

Private company (559,804.) Capital £100 in £1 shares. To carry on the business of manufacturers, exporters and importers of and dealers in inks, fluids, paint and all other chemical compounds and manufactures for use in ball point and fountain pens and pencils etc. Subscribers (each with one share): Colin G. Stickler and George Conrad, of 11 Old Jewry, London EC2. The first directors are not named. Solicitors: Clifford-Turner & Co. 11 Old Jewry, London EC2.

Samuel Pitt & Sons Ltd.

Private company (31,234.) Capital £10,000 in £1 shares. To acquire the business of Samuel Pitt & Co., 95 Bath Street, Glasgow; and to carry on the business of general merchants and agents for asbestos, ores, chemicals and fertilizers etc. Directors: S. Q. Pitt, 7 Dirleton Avenue, Glasgow S1, B. Pitt, Ramoyle, Knowe Road, Newton Mearns, Renfrewshire, M. Pitt, and M. Pitt, Jnr., of 'Ingledene', Davieland Road, Whitecraigs, Renfrewshire.

Silicone Processes Ltd.

Private company. (560,002). Capital £900 in £1 shares. To act as attorneys, managers, agents, representatives. Power is taken to carry on the business of chemists and metallurgical chemists, assayers and refiners, engineers, founders, smiths, machinists and manufacturers of engineering products, components and accessories etc. Subscribers: A. W. Mallinson and B. A. D. Holt of 18 Austin Friars, London EC2.

Robert Goldsbrough Ltd.

Private company. (559,999). Capital £100 in £1 shares. To carry on the business of analytical, consulting and manufacturing chemists etc. Directors: Robert E. Goldsbrough and Dorothy E. Goldsbrough of 70 West Hill, Putney SW15. Registered office: 70 West Hill, Putney, London SW15.

H. J. Adamson & Son Ltd.

Private company. (560,071). Capital £1,000 in £1 shares. To carry on the business of manufacturers of and dealers in chemicals, gases, drugs, medicines etc. Directors: Harold J. Adamson and Mrs. Marie Adamson of The Braes, Lampits Hill, Corringham, Essex, and James D. Adamson, 6 The Terrace, Lampits Hill, Corringham, Essex. Registered office: 6 The Terrace, Lampits Hill, Corringham, Essex.

Company News

Aspro Ltd.

In order to achieve greater efficiency and further development Aspro Ltd. has decided to change its name to Aspro-Nicholas Ltd. By amalgamating the company's activities with those of its subsidiary, Nicholas Products Laboratories, all functions connected with the company's products will be integrated at one place when the new factory at Slough, Bucks, is completed. As capital investment required for the scheme will be considerable it has been decided to apply for powers to borrow up to twice the paid-up capital and that the premium of 2s 6d per share which otherwise would be payable to preference shareholders in a winding-up should become payable if the preference capital is reduced by repayment. Under present articles, drawn up on incorporation in 1935, the limit is £250,000. With capital of £1,500,000 now in issue, the new proposal would raise the limit to £3,000,000.

Smith & Walton Ltd.

At the 25th annual general meeting of Smith & Walton Ltd., manufacturers of and dealers in paints, varnishes, enamels etc, it was announced that the policy of expansion would be continued. On 28 November 1955 the merger with Ashley United Industries Ltd. was completed following the formation of a new company, Smith & Walton (Central Africa) Pvt. Ltd., on 1 April 1955. During the year sales of the group's products increased and net profit rose to £127,000, compared with £98,000 in the previous year, and £73,000 in 1953. In 1952 the net profit was £46,000. Final dividends proposed for the year to 30 September 1955 are on the ordinary and deferred ordinary capital of the company before the merger. It is proposed that the final dividend be maintained at the same level as last year.

Socony Mobil Oil

The directors have voted to recommend at the annual general meeting on 26 April an increase in authorized capital stock to 75,000,000 shares of $15 par from the present figure of 40,000,000 shares of the same value.

Next Week's Events

MONDAY 30 JANUARY

Incorporated Plant Engineers

Leeds: The University, 7.30 p.m. 'An Introduction to Atomic Energy' by J. A. Dixon, M.A.

TUESDAY 31 JANUARY

SCI (London Section)

London: Royal Society, Burlington House, Piccadilly W1, 6 p.m. Jubilee Memorial Lecture 'La Co-opération Technique Européenne' by M. Jean Gerard, vice-president of the Societe de Chimie Industrielle.

Society of Instrument Technology

London: Manson House, Portland Place W1, 6.30 for 7 p.m. 'Industrial Measurement of Gas Temperature' by A.M. Goodridge, B.Sc., R. Jackson, M.Sc., Ph.D., F.Inst.P., F.I.M., A.M.I.E.E., & G.G. Thurlow, M.Sc.(Eng.), A.M.Inst.F., G.I. Mech. E.

WEDNESDAY 1 FEBRUARY

RIC (London Section)

London: Walthamstow Technical College, Forest Road E17, 7 p.m. 'Silicones—Their Manufacture, Application & Analysis' by J.S. Hughes, B.Sc., F.R.I.C., & R.L. Bass, B.Sc., A.R.I.C.

Institute of Fuel

London: Institution of Civil Engineers, Great George Street SW1, 5.30 p.m. 'The Harnessing of Nuclear Power for Industry' by J. L. Gillams, M. A.

SCI (S. Wales Section)

Newport: Technical College, 7 p.m. 'Chemistry of Rockets' by E.G. Lewis.

THURSDAY 2 FEBRUARY

RIC (London Section)

Brighton: Technical College, 6.30 for 7 p.m. 'Chromatography' by Tudor S. G. Jones, B.Sc., Ph.D., A.R.I.C.

The Chemical Society

London: The Royal Institution, Albemarle Street, 2.30 & 7.30 p.m. Symposium, 'Recent Advances in the Chemistry of Colouring Matters' arranged by Professor E.A. Braude, D.Sc., F.R.I.C.

Bristol: Chemistry Department, The University, 'Operational Research' by D. Hicks.

Leeds: Queen's Hotel, 7.30 p.m. 'Colour' by Dr. Vickerstaff, M.Sc., Ph.D., A.R.I.C.

Hull: Chemistry Department, The University, 6 p.m. 'Designing New Rubber-Like Polymers' by Professor G. Gee, M.Sc., Ph.D., F.R.S.

Sheffield: Chemistry Lecture Theatre, The University, 7.30 p.m. 'Chemical Aspects of Nucleotide Biosynthesis' by Professor J. Baddiley, M.Sc., Ph.D.

FRIDAY 3 FEBRUARY

SCI (Edinburgh Section)

Glasgow: Royal Technical College, 7.30 p.m. 'La Co-opération Technique Européenne' by M. Jean Gerard, vice-president of the Societe de Chimie Industrielle.

SCI (Aberdeen Section)

Aberdeen: Marischal College, 7.30 p.m. 'Analytical Chemistry, Chemical Analysis & the Analyst' by R.C. Chirnside, F.R.I.C.

The Chemical Society

Exeter: Washington Singer Laboratories, 5 p.m. 'Some Stereochemical Problems' by Professor E. E. Turner, M.A., D.Sc., F.R.I.C., F.R.S.

Southampton: Chemistry Department, The University, 5 p.m. 'Magnetism & the Structure of Inorganic Molecules' by Professor R.S. Nyholm, D.Sc., A.R.I.C.

Swansea: University College, 6 p.m. 'The Actinide Elements' by H.A.C. McKay, B.A.

Society of Instrument Technology

Fawley: Copthorne House, Fawley, Hants, 7 p.m. 'Process Analysis' by J. McMillan (ICI).

SATURDAY 4 FEBRUARY

Institution of Chemical Engineers

Birmingham: The Midlands Institute, 2.30 p.m. Annual general meeting of the Midlands branch.

RIC & SCI Joint Dance

The London sections of the Royal Institute of Chemistry and the Society of Chemical Industry are to hold a joint buffet dance at the Caxton Hall, Westminster, London, on Saturday 25 February. Tickets, which are limited to 340, can be obtained from Mr. P. F. Corbett, Shell-Mex & BP Ltd., Horne Lane, Greenwich, London SE10, or the Assistant Secretary, Society of Chemical Industry, 56 Victoria Street, London SW 1, price 12s 6d each.

Tonnage Oxygen Project

BOC Plans at Middlesbrough

AN announcement of a further tonnage oxygen project at Middlesbrough has been made by British Oxygen. News of another tonnage oxygen plant at Scunthorpe, to aid the steel industry in Lincolnshire, was announced last October.

Very large oxygen plants of the most up-to-date type will be installed on a site which has been recently acquired on Tees-side, and the plant installed initially will be able to produce between 250 and 300 tons of oxygen per day.

The installation will include a large tonnage oxygen gas plant, suitable for supplying not only the metallurgical requirements of the steelmakers in the area, but also their general purpose needs. This plant was only developed comparatively recently by British Oxygen and it is claimed to afford in operation a degree of flexibility which commends itself to the steelmaker in coping with his current problems of increasing demand. It is expected that this large tonnage oxygen plant will be in operation early in 1957. Other plants on the site, however, will be put into operation before that date.

The advent of this large new oxygen-producing works is of particular interest at this time, when the steel industry is looking forward to yet more extensive production programmes in the immediate years ahead.

The new works, in addition to providing oxygen and chemical gases for the local steel and chemical industries, will also serve other industries in the Middlesbrough area, and it is believed, will generally enhance the position of many important commodities on the north-east coast.

Plans are also being made for a further phase of development on the new site, to cope with the continually growing demand for metallurgical oxygen.

Price Reductions

Kestner Evaporator & Engineering Co. Ltd., chemical engineers of London, have reduced the prices of their range of light-weight portable-type stirrers fitted with shafts which are adjustable through the hollow spindle of the driving motor.

CLASSIFIED ADVERTISEMENTS

SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through a Local Office of the Ministry of Labour or a Scheduled Employment Agency if the applicant is a man aged 18-64 inclusive, or a woman aged 18-59 inclusive, unless he or she, or the employment, is excepted from the provisions of the Notifications o Vacancies Order, 1952.

EXPERIMENTAL OFFICERS AND ASSISTANT EXPERIMENTAL OFFICERS in various Government Departments. The Civil Service Commissioners invite applications for pensionable posts. Applications may be accepted up to 31st December, 1956, but forms should be returned as soon as possible as an earlier closing date may be announced either for the competition as a whole or in one or more subjects.

The posts are divided between following main groups and subjects (a) Mathematical and Physical Sciences, (b) Chemistry and Metallurgy, (c) Biological Sciences, (d) Engineering subjects and (e) Miscellaneous (including e.g. Geology, Library and Technical Information Services)

AGE LIMITS: For Experimental Officers, at least 26 and under 31 on 31st December, 1956; for Assistant Experimental Officers at least 18 and under 28 on 31st December, 1956. Extension for regular service in H.M. Forces. Candidates aged 31 or over with specialised experience for Experimental Officer posts may be admitted.

Candidates must have at least one of a number of specified qualifications. Examples are Higher School Certificate, General Certificate of Education, Scottish Leaving Certificate, Scottish Universities Preliminary Examination, Northern Ireland Senior Certificate (all in appropriate subjects and at appropriate levels). Higher National Certificate, University degree. Candidates taking their examinations in 1956 may be admitted. Candidates without such qualifications may be admitted exceptionally on evidence of suitable experience. In general a higher standard of qualification will be looked for in the older candidates than in the younger ones.
SALARY (London):—

Experimental Officer £790—£960 (men); £706-£866 (women).

Assistant Experimental Officer. £320 (at age 18) to £700 (men), £628 (women). Starting pay up to £575 (men) or £541 (women) at 26 or over. Somewhat lower outside London. Promotion prospects. Women's scales being improved under equal pay scheme.

Further particulars from Civil Service Commission, Scientific Branch, 30, Old Burlington Street, London, W.1., quoting No. 894-95/56.
8565/60/11/55/FW/a

BORAX CONSOLIDATED, LIMITED has vacancies for several senior and junior Chemists with degree or equivalent to carry out in their London Laboratory basic and industrial research in **INORGANIC AND PHYSICAL CHEMISTRY**.

Excellent working conditions. 5-day week. Free lunches. Generous pension scheme, etc.

Salary commensurate with qualifications and experience.

Give fullest details which must be in writing and address in confidence to Staff Manager, Borax House, Carlisle Place, S.W.1.

WEST AFRICAN INSTITUTE FOR OIL PALM RESEARCH, NIGERIA.

Applications are invited for the post of **Research Engineer,** at the **West African Institute for Oil Palm Research.**

Duties are primarily research and development in connection with engineering problems, particularly those arising in the processing of oil palm fruit in plantation oil mills of various kinds. The officer will be required to work in close collaboration with other members of the Institute staff concerned with the production of the crop in the field and will be required to modify existing plant or design new.

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Free passages are provided for the officer, his wife and all children under 13 years of age. Furnished Government quarters are provided if available at a rental of 10% basic salary subject to a maximum of £150 per annum. Leave is granted at the rate of 7 days for each completed month of resident service.

Candidates, not less than 26 years of age, should hold a good honours degree in Mechanical or Chemical Engineering, and have had at least 3 years post graduate experience in the design and operation of plant for vegetable oil extraction and processing. They must possess a 'research outlook' and should be well versed in the critical appreciation of practical problems from a scientific angle. They must be well qualified engineers with a particular aptitude for mechanical matters, and have a good knowledge and experience of chemistry.

Apply, in writing, to the Director of Recruitment, Colonial Office, Great Smith Street, London, S.W.1, giving briefly age, qualifications and experience. Mention the reference number BCD.197/199/01.

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Supplementary information and forms of application from **HIGH COMMISSION OF INDIA, ESTABLISHMENT DEPARTMENT, ALDWYCH, LONDON, W.C.2,** quoting 202/9/21C Last date for receipt of applications 29th February, 1956.

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